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14. ABSTRACT

A comprehensive literature review on the topics yielded numerous publications for cholinergic crisis (1,032) and pediatric/neonatal intubation (475). These results provided a foundation for the following in both clinical domains: creation of comprehensive task analyses, identification of critical tasks and standards of performance, curriculum deficits, strengths and weaknesses of various training platforms (simulation, animal, multimedia), and development of assessment instruments (cognitive, psychomotor, affective). Validation data were collected for pediatric/neonatal intubation instruments. All assessment instruments were reviewed by experts and statistical calculations (ANOVA) to evaluate the construct validity for each of the five assessment instruments indicated that each were able to differentiate between all provider experience levels at p=.000 significance. Reliability calculations (Cronbach's alpha) demonstrated excellent reliability ranging between .82 and .95. Subject distribution at this reporting time is Animal (N=127) and Simulator (N=167). Preliminary results show all subjects significantly improved with both interventions (p=.000). Retention assessment will continue through 2014. Instructional components and collection of sufficient data for assessment instrument validation for the cholinergic crisis arm were completed in Q3-2013 and Q4-2013, respectively.

15. SUBJECT TERMS

Simulation training, Animal training, Intubation, Pediatric, Neonatal, Cholinergic Crisis, Nerve Agents, Multimedia training, Clinical training

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Introduction

The purpose of this research is to evaluate the relative benefits of two forms of clinical training: live animal and simulation based methods. There are two arms of the study: 1) recognition and clinical management of a cholinergic event and 2) recognition and clinical management related to the need for pediatric or neonatal intubation (secure airway). The cholinergic crisis arm will consider the relative value of African Green Monkeys and mannequin simulators for 220 subjects gaining short and long term clinical knowledge, skills and affective capabilities. The pediatric/neonatal intubation arm will consider the relative value of domestic cats and mannequin simulators for up to 220 subjects gaining short and long term clinical knowledge, skills and affective capabilities. The results of the study will be used to create evidence-based curricula for the clinical management of cholinergic events and the need for pediatric and neonatal intubation.

Body

Progress towards the completion of each task related to each objective is indicated in the table below. Initial data collection for the pediatric/neonatal intubation arm was completed in Q2-2013. Retention testing for this arm will continue through Q1 2014. SOW and project administration changes required schedule modification for the cholinergic crisis arm of the study. Progress has begun on tasks related to each objective, including initiation of data collection for the cholinergic crisis arm.

Dr. Andreatta began her appointment as an Associate Professor within the University of Minnesota Medical School in Q2 2013. The project award was transferred from the University of Michigan to the University of Minnesota in Q4 2013. Prior to transfer completion, the University of Minnesota funded the project through a pre-award funding mechanism. Resources and infrastructure at the University of Minnesota allowed for streamlined planning and execution of initial training iterations for the cholinergic crisis arm, limiting further delay in completion of project objectives.

The project team established a connection with Plymouth Fire Station to use available facilities for data collection. The relatively large facility allows the project team to utilize standardized patient actors and other resources most efficiently. Completion of the cholinergic crisis training at this location allows recruitment of a subject pool with varying levels of casualty management experience and provides an excellent training environment.

Red Llama Co., the original producer for the cholinergic crisis recognition and response multimedia application, failed to provide adequate quality of work as agreed upon prior to contract initiation. A contract to complete the multimedia application was initiated with Synaptic Design and completed in Q3-2013. Mark 1 Kit was replaced by ANTAA as the primary auto-injector for nerve agent antidote administration, in both instructional and assessment components, to reflect the change in protocol.

Finally, Cheryl Miree resigned from her position as Research Project Manager, effective 10/14/13. Jessica Klotz has assumed the required tasks associated with project management and, along with staff at the SimPORTAL, will ensure all data collection events and administrative responsibilities related to project administration are completed with accuracy and efficiency.

Table 1: Objective 1 Task Completion Progress

Task	Description	Progress
Hire Program Support Personnel. (Months 1-3).	Hire and train program support personnel, including research coordinators, training evaluators, and administrative personnel.	Complete.
Procurement Equipment (Months 4-6)	Identify and procure equipment to support simulation-based training and data collection; mannequin simulators and tablet.	Complete. See Appendix 2 for results.
Task 1. *Complete Objective 1 (Months 1-10)*. We will conduct a systematic review of the literature and professional practice guidelines to identify the critical competencies, associated performance standards (metrics), methods of assessment, and current training pedagogies in order to create a defensible framework for determining and evaluating competency in managing a cholinergic crisis and performing pediatric and neonatal intubation.		

Task	Description	Progress
Task 1a.	Seek and obtain Institutional Review Board Approval	Complete for All Phases. University of Minnesota IRB#: HSC1308E41582 UMIRBMED # HUM00056754
Task 1b.	Conduct systematic review of the literature, professional practice guidelines, and training pedagogies for managing cholinergic crisis and pediatric/neonatal intubation (PRISMA protocol).	Complete. Appendix 1 for pediatric/neonatal results. See Appendix 2 for cholinergic crisis results.
Task 1c.	Assemble complete task analyses for managing cholinergic crisis and pediatric/neonatal intubation.	Complete. See Appendix 3 for pediatric/neonatal results. See Appendix 4 for cholinergic crisis results.
Task 1d.	Identify critical steps for managing cholinergic crisis and pediatric/neonatal intubation.	Complete. See Appendix 5 for results.
Task 1e.	Identify potential sources of error for managing cholinergic crisis and pediatric/neonatal intubation.	Complete. See Appendix 5 for results.
Task 1f.	Establish preliminary performance standards for managing cholinergic crisis and pediatric/neonatal intubation.	Complete. See Appendixes 3 and 4 for results.
Task 1g.	Determine instructional needs for managing cholinergic crisis and pediatric/neonatal intubation from the results of Tasks 1a-f.	Complete. See Appendix 6 for results.
Task 1h.	Determine if the instructional needs for managing cholinergic crisis and pediatric/neonatal intubation identified in Task 1g correlate with existing curricula.	Complete. See Appendix 6 for results.
Task 1i.	Select, design or develop performance assessment instruments and methods for assessing competency in managing cholinergic crisis and pediatric/neonatal intubation	Complete. See Appendix 7 for results.
Task 1j.	Collect validity evidence for assessment instruments and methods determined through Task 1i.	Complete. See Appendix 10 for results.
Task 1k.	Modify current instructional pedagogies for managing cholinergic crisis and pediatric/neonatal intubation to bridge gaps identified in Task 1h.	Complete. See Appendix 8 for results.
Task 1l.	Prepare training materials for managing cholinergic crisis and pediatric/neonatal intubation based on the results of Task 1k.	Complete. See Appendix 8 for results.
Task 1m.	Verify assessment instruments and methods based on the results of Task 1j. Modify as required.	Complete. See Appendix 10 for results.
Task 1n.	Prepare assessment materials based on the results of Task 1m, including proposed performance standards.	Complete. See Appendix 7 for results.
Task 1o.	Assemble data-driven, defensible competency assessment program for managing cholinergic crisis and pediatric/neonatal intubation to be evaluated during Objective 2.	Complete. See Appendixes 7 &10 for results.

Task	Description	Progress
Task 1p.	Assemble data-driven, defensible training program for managing cholinergic crisis and pediatric/neonatal intubation to be evaluated during Objective 2. No anticipated delays in schedule.	Complete. See Appendixes 8 &10 for results.
Task 1q.	Prepare preliminary project report documenting the results of Objective 1.	Complete. Submitted 03 Dec 2012
Task 1r.	Identify multimedia producer for cholinergic crisis application.	Complete.
Task 1s.	Identify video producer for cholinergic crisis live animal arm.	Complete. Manny-O Productions contracted.
Task 1t.	Participate in Program Review 1.	Complete. 24 July 2012
Task 2. *Complete Objective 2 (Months 12-33)*. We will examine the relative benefits of using live animal and simulator models for training subjects to clinically respond to a cholinergic crisis and perform pediatric/ neonatal intubation using competency assessment for cognitive, psychomotor, and affective performance dimensions.		
Task 2a.	Recruit subjects for Objective 2.	Complete, Pediatric/Neonatal Intubation. See Appendix 11 for results. Estimated Q1 2014 completion for Cholinergic Crisis.
Task 2b.	Script multimedia application.	Complete. See Appendix 8 for results.
Task 2c.	Identify Interactive steps in multimedia application.	Complete. See Appendix 8 for results.
Task 2d.	Script video production for animal portion of multimedia application.	Complete. See Appendix 8 for results.
Task 2e.	Secure animation for simulation portion of multimedia application.	Complete. See Appendix 8 for results.
Task 2f.	Shoot and produce video of animal interaction.	Complete. See Appendix 8 for results.
Task 2g.	Integrate videos into multimedia application.	Complete. See Appendix 8 for results.
Task 2h.	Test multimedia application.	Complete.
Task 2i.	Program SimMan3G for cholinergic crisis events – mild and moderate exposure for vapor and liquid nerve agents.	Complete. See Appendix 8 for results.
Task 2j.	Hire standardized patients.	Complete.
Task 2k.	Train standardized patients.	Complete.
Task 2l.	Complete pre-assessment of subjects to determine baseline abilities managing cholinergic crisis	In process. Estimated Q1 2014 completion.
Task 2m.	Conduct cholinergic crisis training using either live animal or simulator models	In process. Estimated Q1 2014 completion.
Task 2n.	Complete 1st post-assessment of subjects to assess their learning of how to manage cholinergic crisis immediately after training.	In process. Estimated Q1 2014 completion.
Task 2o.	Complete 2nd post-assessment of subjects to assess their retention of how to manage cholinergic crisis at three time intervals after training (6, 18, or 52 weeks).	Scheduled. Estimated Q3 2014 completion.
Task 2p.	Complete data analyses to assess performance differences between live animal and simulator training for managing cholinergic crisis.	Scheduled. Estimated Q3 2014 completion
Task 2q.	Complete pre-assessment of subjects to determine baseline abilities managing pediatric/neonatal intubation	Complete. See Appendix 11 for results.

Task	Description	Progress
Task 2r.	Conduct pediatric/neonatal intubation training using either live animal or simulator models	Complete. See Appendix 11 for results.
Task 2s.	Complete 1st post-assessment of subjects to assess their learning of how to manage pediatric/neonatal intubation immediately after training.	Complete. See Appendix 11 for results.
Task 2t.	Complete 2nd post-assessment of subjects to assess their retention of how to manage pediatric/neonatal intubation at three time intervals after training (6, 18, or 52 weeks).	In process. Estimated Q1 2014 completion.
Task 2u.	Complete data analyses to assess performance differences between live animal and simulator training for managing pediatric/neonatal intubation.	Scheduled. Estimated Q1 2014 completion.
Task 2v.	Prepare secondary project report documenting the results of Objective 2.	Complete. Submitted 03 Dec 2013
Task 2w.	Participate in Program Review 2.	Complete. 13 May 2013
Task 3. *Complete Objective 3 (Months 10-36)*. Using the ADDIE model of curriculum design, we will develop comprehensive evidence-based curricula for the management of cholinergic crisis and pediatric/neonatal intubation, inclusive of all curricular components and formal evaluation and transition plans.		
Task 3a.	Write training objectives for cholinergic crisis training	In process.
Task 3b.	Document standards of performance for managing cholinergic crisis for multiple provider levels (novice to expert; medic to physician)	In process.
Task 3c.	Define instructional methods for best facilitation and delivery of cholinergic crisis training	In process.
Task 3d.	Specify optimal material and human resources requirements for cholinergic crisis training	To be scheduled.
Task 3e.	Authenticate competency assessment methods in the management cholinergic crisis training using data-derived reliability and validity evidence collected through Objectives 1 and 2.	In Process.
Task 3f.	Prepare a formal evaluation plan for the evidence-based cholinergic crisis curriculum using Kirkpatrick's 4-level Model.	To be scheduled.
Task 3g.	Write training objectives for pediatric and neonatal intubation training	In process.
Task 3h.	Document standards of performance for managing pediatric and neonatal intubation for multiple provider levels (novice to expert; medic to physician)	To be scheduled.
Task 3i.	Define instructional methods for best facilitation and delivery of pediatric and neonatal intubation training	In process.
Task 3j.	Specify optimal material and human resources requirements for pediatric and neonatal intubation training	To be scheduled.
Task 3k.	Authenticate competency assessment methods in pediatric and neonatal intubation training using data-derived reliability and validity evidence collected through Objectives 1 and 2.	In process.

Task	Description	Progress
Task 3l.	Prepare a formal evaluation plan for the evidence-based pediatric and neonatal intubation curriculum using Kirkpatrick's 4-level Model.	To be scheduled.
Task 3m.	Prepare final project report documenting the results of Objective 3.	To be scheduled.
Task 3n.	Prepare a formal transition plan for implementing the next steps for transferring project-related outcomes to other identified areas of interest	To be scheduled.
Task 3o.	Participate in Program Review 3	To be scheduled.

Key Research Accomplishments

Year 1

- Comprehensive literature review and meta-analyses for Pediatric/Neonatal Intubation and Cholinergic Crisis.
    - Identified training gaps:
        - Poor assessment metrics
        - Weak or absent performance standards
        - No statistically validated assessment instruments
    - Identified technology gaps:
        - SimMan3G
        - SimBaby
        - SimNewB
- Derived assessment instruments for Pediatric/Neonatal Intubation
    - Established performance standards
    - Excellent validity
    - Excellent reliability
- Derived instruction materials for Pediatric/Neonatal Intubation
    - Improved performance in both animal and simulation contexts
    - Elevated heart rates (stress induction) in both animal and simulation contexts

Year 2

- Derived assessment instruments for Cholinergic Crisis Recognition and Response
    - Established performance standards
    - Excellent validity
    - Excellent reliability
- Derived instruction materials for Cholinergic Crisis Recognition and Response
    - Improved performance in both animal and simulation contexts
    - Elevated heart rates (stress induction) in both animal and simulation contexts

Reportable Outcomes

- Pediatric and neonatal intubation performance assessment: Validity and reliability data for assessment instruments – manuscript in process.
- Cholinergic crisis recognition and management: Validity and reliability data for assessment instruments – manuscript in process.
- Simulation-based technology gaps for advanced clinical training – manuscript in process.
- Meta-analysis for pediatric/neonatal intubation training – manuscript in process.
- Meta-analysis for cholinergic crisis training – manuscript in process.

Conclusion

Clinical education has historically relied on intangible measures of clinical performance, which to date has made it difficult to unequivocally assert effectiveness of any form of training, be that live animal training or simulation-based training. One of the primary obstacles to conducting direct methodological comparisons is a lack of accepted standards of performance and measurement for most clinical processes and procedures. Through comprehensive analyses, we have identified performance standards, critical steps, and potential sources for error for the clinical management of cholinergic crisis and performing pediatric and neonatal intubation. We have used this information to derive assessment instruments to measure applied performance in each clinical area, and assembled validity and reliability evidence for those instruments in the area of pediatric and neonatal. Valid data are critical for any substantive scientific inquiry and mandatory for the accurate assessment and evaluation of clinical proficiency. Without valid metrics, any examination of live animal or simulation-based training effectiveness would simply be qualitative conjecture. The validated metrics we have derived for performing pediatric and neonatal intubation will provide a significant contribution to this and other performance evaluations in pediatric and neonatal intubation. This information is critical for determining optimal, evidence-based training practices that serve to reduce or eliminate the uses of live-animals without diminishing the quality of training. These metrics may be used to assess clinical competence of those trained using data-driven scientific methods, rather than subjective assessment.

There have been several delays related to the moratorium placed on the use of the non-human primate colony at USAMRICD post-award, however we have been able to establish an alternate approach using multimedia that includes animal or simulation elements through videotape and animation, respectively. The multimedia application was completed during Q3 2013. All performance standards, critical steps, and potential sources for error for the clinical management of cholinergic crisis have been integrated into assessment instruments, with data collection to support validity and reliability evidence for the assessment instruments completed in Q4 2014.

References

Comprehensive references are presented in Appendixes 1 and 2.

Appendixes

Appendix 1:Pediatric and Neonatal Intubation Literature Review

Appendix 2: Cholinergic Crisis Literature Review

Appendix 3: Pediatric and Neonatal Intubation Task Analyses

Appendix 4: Cholinergic Crisis Task Analyses

Appendix 5: Critical Steps and Sources of Error

Appendix 6: Instructional Gaps

Appendix 7: Assessment Instruments

Appendix 8: Instructional Components

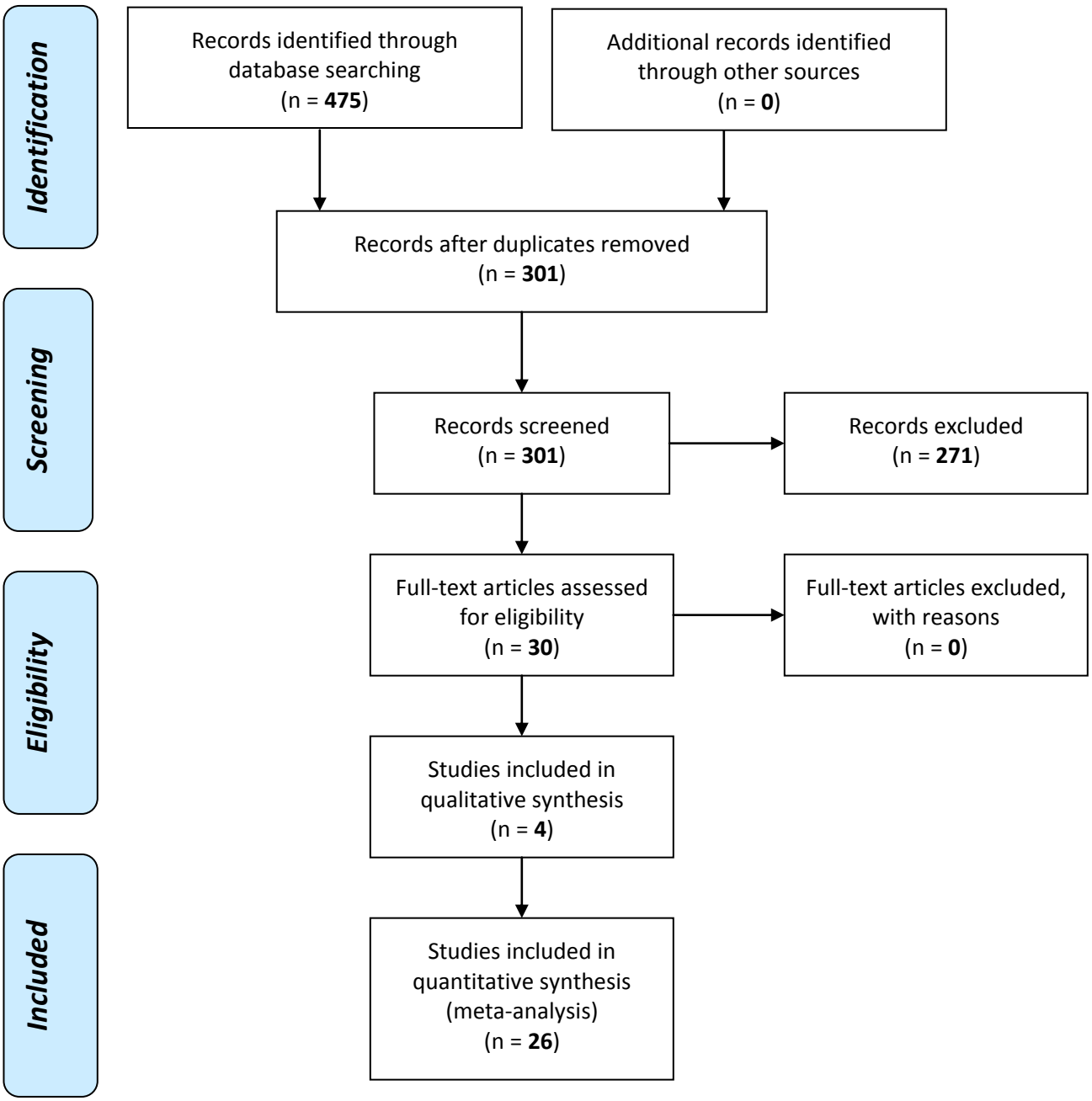
Appendix 9: Training Event Images

Appendix 10: Validity and Reliability Statistics

Appendix 11: Preliminary Data

Appendix 12: Program Review/Summary Report

Appendix 1: Pediatric and Neonatal Intubation Literature Review


Identification
Screening
Eligibility
Included
Records identified through database searching (n = 475)
Additional records identified through other sources (n = 0)
Records after duplicates removed (n = 301)
Records screened (n = 301)
Records excluded (n = 271)
Full-text articles assessed for eligibility (n = 30)
Full-text articles excluded, with reasons (n = 0)
Studies included in qualitative synthesis (n = 4)
Studies included in quantitative synthesis (meta-analysis) (n = 26)

Terms searched:

Pediatric OR Neonatal
AND
Intubation OR Resuscitation OR Airway
AND
Assessment OR Training/teaching OR Education OR Evaluation

Limited to: English language

Databases searched and number of references located:

PreMedline – 1
Medline – 110 + 109 + 77
Embase – 15 + 8
Web of Science – 62 + 78
Scopus - 2
ERIC - 0
Education Abstracts - 0
Government Printing Office Monthly Catalog - 0
Index to Military Periodicals - 0
CINAHL - 12
ProQuest Dissertations & Theses - 0
Health and Psychosocial Instruments – 1

Total = 475 references
Duplicates Removed = 301 references

Manual Review (Criteria for Elimination):

Guidelines and review articles (not original research)
Overall resuscitation evaluated and not independent skill of intubation
Not correct intubation procedure evaluated (video-assisted, LMA, GlideScope, BVM, etc.)
Commentaries/letters (i.e.- on ethics of use of cadavers for training)
No assessment tool or method used (or described)
Studies not comparing or evaluating methods of or models for training and/or assessment

Articles Relevant: 30

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Table Heading Descriptions

Citation: *Study reference.*

Sample Size and Description: *Number of subjects trained and/or assessed. Who was trained and/or assessed?*

Study Methods: *Randomized control trial, case control, observational, etc.*

Assessment Mechanism(s):	*What model was used for assessment? Conditions/context of assessment; live, simulation, written?*
Assessment Instrument(s):	*Describe instrument; Checklist vs. global rating scale, etc.*
Assessment Domain(s):	*Cognitive, Psychomotor, Affective,*
Training Method(s):	*Live animal; Clinical setting; Mannequin/simulation; Computer-based, Cadaver (human, animal); Self-study (written, video).*

Citation	Sample Size & Description	Study Methods	Assessment Mechanism(s)	Assessment Instrument(s)	Assessment Domain(s)	Training Method
[1]Adams	- 132 intubations - EM and peds PGY2s or 3s (trained in kitten lab, NICU and PICU rotations) - Respiratory care practitioners (RCPs) (trained on mannequins, OR, 3.5yrs avg job experience) - All got NRP and PALS training	-Prospective, observational of prehospital intubations on pediatric transport team	- Live	- Number of attempts to pass ETT through oropharynx	-PM	- Varied – not controlled - Authors concluded number of attempts might be more important than method of training.
[2]Airman	- 231 intubations - Respiratory therapists and nurses in NICU	-Prospective (?) vs. chart/records review	-Live	-Number of attempts	-PM	-All used same methods – NRP, cats
[3]Benfield	-Newly dead infants in NICU -50 residents and 21 respiratory therapists -180 total intubations	-Retrospective questionnaire -Self-report	-Cadaver	-Self-report, no assessment of skill	-Affective	-Newly dead infant used as training method
[4]Bismilla	-50 intubations in NICU or L&D -25 residents -13 fellows -12 respiratory therapists	-Prospective observational	-Live	-Global rating scale and 13 item checklist -Primary outcome – success -Secondary – duration and #	-PM -Cognitive	Residents/fellows – NRP and clinical training -RTs – experience, didactics, clinical practice -Did not meet NRP standards

				of attempts, checklist and GRS scores		
[5]Calderwood	-Medical students -Anesthetized cats			-Success	-PM	
[6]Falck	-449 intubation attempts -Pediatric residents	-Prospective, observational	-Live intubations in NICU or L&D	-5 point scale – 4=1 try, 3=2 attempts, 2= 3 attempts, 1=4 attempts, 0= no success, competency = 3 or 4 on 80% or more of attempts	-PM -Affective (confidence assessed with retrospective self-report)	-NRP, intubation (animal) lab
[7]Forbes	-27 anesthesia faculty, fellows and residents	-Assessment of model for teaching fiber optic intubation – realism and effectiveness	-Pig -Mannequin	-Secretions -Anatomy -Appearance Technique	-	
[8]Hall	-36 paramedic students -540 test intubations (15 each)	-Prospective, RCT	-Tested on human in OR	-Time to intubation -Number of attempts -Complications	-PM	-HPS (10 hours) vs. human (15 live) in OR after didactics
[9]Baker		-Chart review of EMS runs		-Procedure success -Mortality	-Outcome	-PALS trained vs. not PALS trained EMS
[10]Duran	-42 pediatric residents – 3 groups based on length of time since NRP training	-Prospective, not randomized	-Written -Neonatal sim	-Time to intubation <20sec = success -# of attempts -Written test (>85%)	-Cognitive -PM	-NRP
[11] Powell	-Peds and EM residents, vet techs, med					-Ferrets used as part of PALS training – evaluated trauma to

	students, CRNAs					ferret by # of intubations
[12] Thompson	-10 FP residents - 1st years intubated ketamine anesthetized kittens			-Residents rated usefulness of content 8.1 and style 8.5 (on 0-9 scale)		-30 minute didactic -90minutes hands-on time
[13] Gaushe-Hill	-Paramedics and paramedics in training			-Pre- and post-self efficacy questionnaire -Written evaluation of course -Follow up self efficacy and skill performance (retention study)		-6 hour Pediatric Airway Management Course
[14]Henderson	-Paramedics					-None -Self-instruction -Video -Lecture-demo -No discussion of models or assessment methods
[15]Jennings						-Describes kitten model -No objective evaluation of model
[16]Kircher						-Looks at trauma to model (ferret) not efficacy of training
[17]Kisling	->100 doctors, RTs, nurses			-Valuable learning experience		-Description of kitten model
[18]Youngquist	Convenience sampling 245 paramedics	Convenience sample with controls	-Questionnaire -Mannequin	-Self-efficacy questionnaire -List of skill components	-Self-efficacy -Psychomotor skills	-No training -Video presentation -Self-directed learning -Instructor-facilitated lecture and

						demonstration
[19]Terndrup	36 paramedics	RCT	Live, cat	Checklist	-Cognitive -PM skills	Didactic training
[20]Sukys		Prospective, observational, cross-section		Checklist		
[21]Sudikoff	16 PGY II Pediatric Residents	Randomized Crossover	Simulation	-Global competency score -Critical action checklists, -Harmful actions lists, -Behaviorally Anchored Rating Scale.	PM skills	Simulation enhanced session on pediatric airway management and teamwork
[22]Stewart	146 paramedics	RCT	-Simulation -Live	-Checklist -Multiple-choice exam -Oral exam	-Cognitive -PM skills	Didactic presentation vs. didactic w/sim vs. didactic w/ sim and live
[23]Petrack	-9PEM faculty -4 PEM fellows		Written	Questionnaire	Cognitive	PALS course
[24]Overly	16 pediatric residents	Prospective Observational	Simulation	Checklist	PM skills	
[25]O'Donnell	122 video recording of delivery room resuscitations, residents, fellows, consultants	Retrospective Review	Live	Checklist	PM skills	

[26]Nishisaki	Pediatric or EM resident in PICU	Prospective	Live	Checklist	PM skills	20-min multidisciplinary session and10-min resident skill refresher
[27]Mazzi	PGY 1 HO		-Simulator -Live kitten			Lecture practice on simulation or kittens
[28]Leone	Pediatric Residents		Observation: success and # of attempts	Live	PM skills	
[29]Lane		Retrospective	Video time to completion of task			
[30]Kendirli	16 Pediatric Residents	Prospective	Live	Success and # of attempts	PM Skills	PALS course

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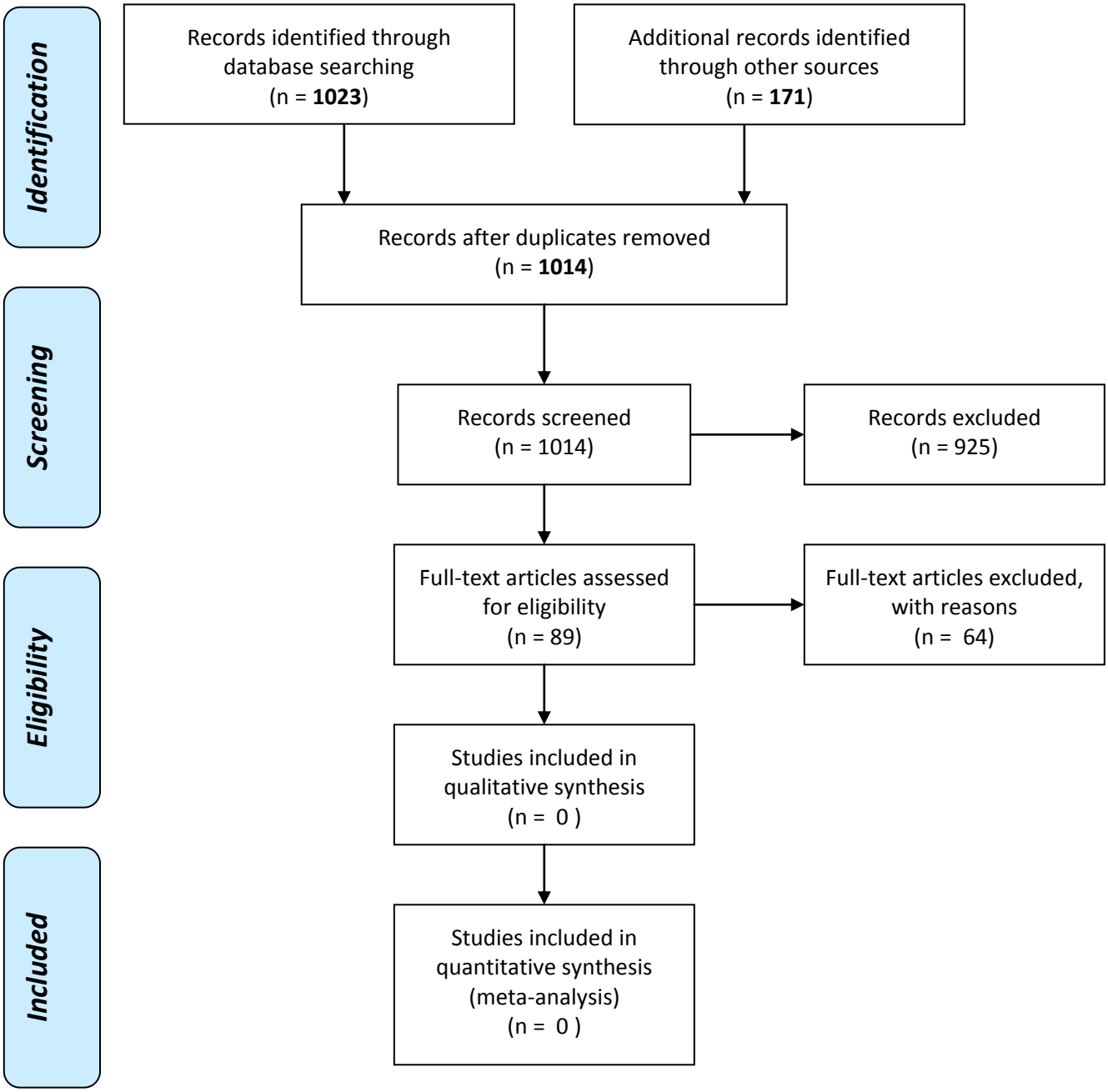
Appendix 2: Cholinergic Crisis Literature Review

PRISMA Cholinergic Crisis Management Training Literature Review Flow Diagram



Terms searched:

exp Organophosphorus Compounds/ OR exp Cholinesterase Inhibitors/ OR exp Cholinesterases/ OR cholinergic crisis.mp/ OR nerve gas.mp/ OR exp Chemical Warfare/ = 165474 results
AND
training.mp/ OR exp Teaching/exp Education/ = 700731 results
combined = 853 results
AND
management.mp/ OR exp Therapeutics/ = 3559026 results
combined = 274 results
exp Mass Casualty Incidents/ =710 results
AND
training.mp/ OR exp Teaching/exp Education/ =700731 results
combined = 179 results

Specific search terms:

casualty
chemical
chemical warfare
cholinergic
cholinergic crisis
cholinesterase
cholinesterase inhibitors
cholinesterases
compounds
crisis
education
gas
incidents
inhibitors
management
mass
mass casualty incidents
nerve
nerve gas
organophosphorus
organophosphorus compounds
sarin
teaching
therapeutics
training
warfare

Limited to: English language

Databases searched:

PreMedline
Medline
Embase
Web of Science
Scopus
ERIC
Education Abstracts
Government Printing Office Monthly Catalog
Index to Military Periodicals
CINAHL

ProQuest Dissertations & Theses
Health and Psychosocial Instruments
TOTAL = 1032 references

Manual Review (Criteria for Elimination):

Duplicates
Guidelines and review articles (not original research)
Commentaries/letters (not original research)
Bisphosphonates
Studies not comparing or evaluating methods of or models for training and/or assessment

Articles Relevant: 25

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Table Heading Descriptions

Citation:	*Study reference.*
Sample Size and Description:	*Number of subjects trained and/or assessed. Who was trained and/or assessed?*
Study Methods:	*Randomized control trial, case control, observational, etc.*
Assessment Mechanism(s):	*What model was used for assessment? Conditions/context of assessment; live, simulation, written?*
Assessment Instrument(s):	*Describe instrument; Checklist vs. global rating scale, etc.*
Assessment Domain(s):	*Cognitive, Psychomotor, Affective,*
Training Method(s):	*Live animal; Clinical setting; Mannequin/simulation; Computer-based, Cadaver (human, animal); Self-study (written, vi).*

Citation	Sample Size and Description	Study Methods	Assessment Mechanism(s)	Assessment Instrument(s)	Assessment Domain(s)	Training Method
[1]	-3 paramedics	- descriptive				– development of virtual reality simulation game to teach triage skills
[2]	- Medical and nursing students (?#)	- observational	-live (observation) -written	-correct triage categorization -participation satisfaction scale	-cognitive - affective	- Combined didactics and procedure workshops – 10 day course -no comparison
[3]	-105 total participants (multi-agency)	-observational	-live (observation of mock disaster) -written	-patient care errors, system errors -pre-/post-knowledge tests -survey re: benefits of training	-cognitive - affective	-didactics -interactive exercise -mock disaster -no comparison
[4]	-10 physicians -12 nurses		-written (Likert scale)	-subjective measurement of “immersion”, level of confidence		-online virtual reality simulation -no comparison
[5]	-17 medical responders	-observational	-live (observation of mock disaster) -checklist and anecdotal observations	-triage -clinical procedures -radio usage	-cognitive -PM	-assessment only – mock disaster exercise
[6]	-68 medical students		-written pre-/post-	-confidence, perceptions -knowledge of disaster medicine	-cognitive	-didactic and simulation -no comparison
[7]	-128 medical and nursing students	-observational	-written	-triage skill	-cognitive	-comparison of 2 different didactics – pattern recognition vs traditional
[8]	-182 healthcare - providers		-written	-self-confidence -triage skill	-cognitive -affective	-simulation (mannequin-based) -no comparison
[9]	-21 medical students	-observational	-written -checklist	-triage score -intervention	-cognitive -PM	-podcasts and mannequin-based

Citation	Sample Size and Description	Study Methods	Assessment Mechanism(s)	Assessment Instrument(s)	Assessment Domain(s)	Training Method
			-timing	score -speed -self-efficacy	-affective	simulation -no comparison (compares 3 different simulated scenarios)
[10]	-12 paramedics	-observational	-checklist	-triage decisions -actions taken	-cognitive -PM	-combined virtual reality and mannequin-based simulation -no comparison
[11]	-physicians, medical students, clerks	-prospective cohort	-checklist -written	-critical actions -satisfaction with model	-cognitive -PM -affective	-simulation vs live actors
[12]	-24 medical students	-observational	-written -checklist -timing	-triage score -intervention score -speed -self-efficacy	-cognitive -PM -affective	-podcasts and virtual reality simulation -no comparison
[13]	-34 pediatric residents -15 EM residents	-prospective	-written pre-/post-	-medical management	-cognitive	-lecture only -only compared those who attended lecture and those who didn't
[14]	-315 first year medical students	-observational	-written	-triage decisions	-cognitive	-START training (didactic) -no comparison
[15]	-11 physicians -40 nurses -23 administrators -10 other hospital personnel	-prospective	-written	-knowledge of disaster management	-cognitive	-multi-modality - lectures, skills sessions, tabletop sessions, and disaster exercises -no comparison
[16]	-54 first responders	-prospective	-written	-recognition, triage and decontamination	-cognitive	-mannequin-based simulation -video clinical vignettes -no comparison
[17]	-EMS personnel	-descriptive				-describes development and implementation of mass casualty drill (live patients) -no testing or comparison

Citation	Sample Size and Description	Study Methods	Assessment Mechanism(s)	Assessment Instrument(s)	Assessment Domain(s)	Training Method
[18]	-military medical personnel	-descriptive				-describes development of simulated disaster with 50 “patients” -no testing or comparison
[19]	-US Air Force reserves	-descriptive	-written	-confidence		-no specific descriptions of training -no comparisons
[20]	- 8 anesthesiologists – 8 nurses		-observation -written	-time -quality of intubation rating		-simulation of intubating while wearing protective equipment
[21]	-182 military personnel	-descriptive	-written -biological responses		-affective	-describes reactions to simulated scenarios -prior training not controlled for -tested with simulation
[22]		-descriptive				-describes development of multi-modality training curriculum -no testing or comparison
[23]	-92 military reserve nurses	-prospective experimental	-score on management of chemical warfare patients performance instrument (observation, 105 elements/actions)	-management of chemical exposure	-cognitive	-high fidelity simulation vs CD-ROM vs control (no teaching)

Citation	Sample Size and Description	Study Methods	Assessment Mechanism(s)	Assessment Instrument(s)	Assessment Domain(s)	Training Method
[24]		-descriptive				-describes 2 day multi-modality “train the trainer” course development and implementation -no testing or comparison
[25]		-descriptive				-describes development of model for computer-based simulation of nerve gas exposure. -no testing or comparison

Appendix 3: Pediatric and Neonatal Intubation Task Analyses

Task Analyses: Recognition Of Need And Clinical Management Of Pediatric & Neonatal Endotracheal Intubation

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Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
Factual	**Anatomy** 1. Understand the functions of the following organ systems: • Respiratory • Cardiovascular • Neurological • Musculoskeletal • Endocrine • Gastrointestinal 2. Understand the differences between adult and pediatric and neonatal airway anatomy: • Epiglottis (floppier, u-shaped) • Tongue (relatively larger) • Hyoid bone • Airway (more anterior, higher) • Vocal cords (less narrow) • Thyroid cartilage • Cricoid ring (narrowest) • Trachea (more flexible) • Funnel shaped vs. cylindrical	**Anatomy** 1. Identify the functions of the listed organ systems on a written test. 2. Identify the differences between adult and pediatric and neonatal airway anatomy on a written test.	**Anatomy** 1. Correctly identifies the functions of the listed organ systems. 2. Correctly identifies the differences between adult and pediatric and neonatal airway anatomy.	**Anatomy** N/A	**Anatomy** N/A	**Anatomy** N/A
Factual	**Physiology** 1. The normal action of respiration in pediatric and neonatal patients. 2. The effect of altered, obstructed,	**Physiology** 1. Identify the normal function of respiration in pediatric and neonatal patients in a	**Physiology** 1. Correctly explain the normal function of respiration in pediatric and neonatal	**Physiology** N/A	**Physiology** N/A	**Physiology** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	inadequate, and cessation of respiration on the cardiovascular and nervous systems in pediatric and neonatal patients. The parts of the human body affected by altered, obstructed, inadequate, and cessation of respiration: *Decreased Oxygenation*: • Results in tissue ischemia. • Leads to anaerobic metabolism • Leads to acidosis • End result is damage to every organ system. • Organs with highest energy requirements/ O2 usage are affected first: Brain - mental status changes/coma Kidneys- renal failure Heart - myocardial damage Liver - hypoxic liver damage Gut - ischemic gut *Decreased Ventilation* (not clearing CO2): • Leads to hypercarbia	written test. 2. Describe how altered, obstructed, inadequate, and cessation of respiration affects the cardiovascular and nervous systems in pediatric and neonatal patients in a written test.	patients. 2. Correctly explain how altered, obstructed, inadequate, and cessation of respiration affects the cardiovascular and nervous systems in pediatric and neonatal patients			

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	• Results in altered mental status/ confusion/ coma (CNS effects) • Results in acidosis • Leads to damage to every organ system: • Brain - mental status changes/coma • Kidneys- renal failure • Heart - myocardial damage • Liver - hypoxic liver damage • Gut - ischemic gut *Mechanical airway protection, due to decreased mental status or other cause of inability to protect airway*: • Leads to aspiration of stomach contents/ acids, blood, tissue, etc. • Leads to pneumonitis (inflammation/damage to lungs) • Leads to possibly infection (aspiration pneumonia) • Aspiration can also lead to airway occlusion • Leads to effects of decreased oxygenation and					

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	decrease ventilation.					
Factual	**Clinical** 1. Know how to assess the primary physical and physiological signs to look for during patient assessment to identify the need for airway management: • Mouth • Nose; Nasal Flaring • Respiratory effort • Retractions • Apnea • Cyanosis • Pulse 2. Knows why to intubate: *Failure to Ventilate* (remove carbon dioxide). • Neuromuscular weakness • Obstructive pulmonary disease *Failure to Oxygenate*. • Pulmonary disease *Failure to protect airway*. • Altered mental status – neurologic, toxic *Failure to maintain patent airway*. • Obstruction, secretions, injury,	**Clinical** 1. Describe the physical and physiological signs to look for during patient assessment in written test. 2. Indicate on a written test how to determine if intubation is necessary in a pediatric and neonatal patient.	**Clinical** 1. Correctly describes the primary physical and physiological signs to look for during patient assessment to identify the need for airway management on a written test. 2. Correctly indicates on a written test how to determine if intubation is necessary in a pediatric and neonatal patient.	**Clinical** 1. Be able to examine pediatric and neonatal patients to assess indicators of need for airway management: • Mouth • Nose; Nasal Flaring • Respiratory effort • Retractions • Apnea • Cyanosis • Pulse 2. Be able to examine pediatric and neonatal patients to assess indicators of need for intubation: *Failure to Ventilate* (remove carbon dioxide). • Neuromuscular weakness • Obstructive pulmonary disease *Failure to Oxygenate*. • Pulmonary	**Clinical** 1. Demonstrate the ability to examine pediatric and neonatal patients to assess the need for airway management in a simulated context with pediatric and neonatal mannequin simulators. 2. Demonstrate the ability to examine pediatric and neonatal patients to assess indicators of need for intubation in a simulated context with pediatric and neonatal mannequin simulators.	**Clinical** 1. Correctly demonstrates the ability to examine pediatric and neonatal patients to assess the need for airway management in a simulated context with pediatric and neonatal mannequin simulators. 2. Correctly demonstrates the ability to examine pediatric and neonatal patients to assess indicators of need for intubation in a simulated context with pediatric and neonatal mannequin simulators.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	blood *Significant hemodynamic instability*. *Operative needs*.			disease *Failure to protect airway*. • Altered mental status – neurologic, toxic *Failure to maintain patent airway*. • Obstruction, secretions, injury, blood *Significant hemodynamic instability*. *Operative needs*.		
Factual	**Medication** 1. Knows the drugs, dosages, reasons for use, administration routes and time sequences for intubating a neonatal and pediatric patient: *Sedative*. • Etomidate (0.3-0.6 mg/kg); IV • Versed (0.05-0.1 mg/kg); IV • Ketamine (1-2mg/kg); IV *Paralytic*. • Succinylcholine (1-2 mg/kg); IV *Manage Bradycardia*. • Atropine (0.2 mg/kg); IV	**Medication** 1. On a written test, identify the drugs, dosages, reasons for use, administration routes and time sequences for intubating a neonatal and pediatric patient. 2. Describes how to determine the correct drug dose used for	**Medication** 1. Correctly identifies the drugs, dosages, reasons for use, administration routes and time sequences for intubating a neonatal and pediatric patient. 2. Correctly describes how to determine the correct drug dose	**Medication** 1. Be able to place an IV catheter. 2. Be able to identify and secure the following medications: • Etomidate • Versed • Ketamine • Succinylcholine • Atropine 3. Be able to administer the appropriate dosages and drugs through IV	**Medication** 1. Demonstrate the ability to place an IV catheter in a simulated context with pediatric and neonatal mannequin simulators. 2. Be able to identify and secure the appropriate medications in a simulated context. 3. Be able to	**Medication** 1. Correctly places an IV catheter in a simulated context with pediatric and neonatal mannequin simulators. 2. Correctly identifies and secures the appropriate medications in a simulated context. 3. Correctly administers the appropriate dosages and drugs through IV catheter in a simulated context with pediatric and

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	2. Knows how to determine the correct drug dose used for intubating a neonatal and pediatric patients: • Broselow Tape • Calculate using dose/weight. • Monitor clinical effect • Adjust dose as needed for clinical effect. 3. Knows ketamine is the best sedative for patients with asthma.	intubating a neonatal and pediatric patient on a written test. 3. Identify ketamine as the best sedative for patients with asthma on a written test.	used for intubating a neonatal and pediatric patient on a written test. 3. Correctly identifies ketamine as the best sedative for patients with asthma on a written test.	catheter.	administer the appropriate dosages and drugs through IV catheter in a simulated context with pediatric and neonatal mannequin simulators.	neonatal mannequin simulators.
Factual	**Health Metrics** Understand relevant health metrics for assessing pediatric and neonatal patient's physical and physiological status: • Respiratory status • Integrity of Airway	**Health Metrics** Indicate on a written test which health metrics to assess for a neonatal and pediatric patient who requires intubation.	**Health Metrics** Correctly indicates the health metrics to assess for a neonatal and pediatric patient who requires intubation.	**Health Metrics** N/A	**Health Metrics** N/A	**Health Metrics** N/A
Factual	**Procedural** 1. Describe the patient management strategy for pediatric and neonatal patient who require intubation: • Drugs • Airway • Breathing • Monitoring • Stabilizing	**Procedural** 1. Describe the patient management strategy for pediatric and neonatal patient who require intubation on a written test.	**Procedural** 1. Correctly describe the patient management strategy for pediatric and neonatal patient who require intubation on a written test.	**Procedural** 1. Be able to assess the need for intubation in pediatric and neonatal patients. 2. Be able to administer appropriate dosages of	**Procedural** 1. Be able to assess the need for intubation in pediatric and neonatal patients in a simulated context. 2. Be able to administer	**Procedural** 1. Correctly assesses the need for intubation in pediatric and neonatal patients in a simulated context. 2. Correctly administers appropriate dosages of drugs to a

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	2. Describe the step-by-step sequence for intubating a pediatric and neonatal patient: Administer medications. Patient positioning. • Sniffing position with towel under head & neck • Mild extension further opens / aligns airway • Overextension will hinder Apply suction. Bag-valve-mask. • Mask selection • Mask position • Use C-E hand configuration • Can use jaw thrust • Have firm seal •Do not block anterior neck Insert Laryngoscope Blade. Place Endotracheal Tube. Determine how deep to insert the tube: • Use Broselow tape • 3X Tube size • On end of ETT lines,	2. Describe the step-by-step sequence for intubating a pediatric and neonatal patient on a written test. 3. Describe how to ventilate a pediatric and neonatal patient on a written test. 4. Describe how to determine if a pediatric and neonatal patient is clinically stable on a written test.	2. Correctly describe the step-by-step sequence for intubating a pediatric and neonatal patient on a written test. 3. Correctly describes how to ventilate a pediatric and neonatal patient on a written test. 4. Correctly describes how to determine if a pediatric and neonatal patient is clinically stable on a written test.	drugs: • Sedative • Paralytic • Cardiovascular 3. Be able to perform each step of intubating a neonatal and pediatric patient: Administer medications. Patient positioning. • Sniffing position with towel under head & neck • Mild extension further opens / aligns airway • Overextension will hinder Apply suction. Bag-valve-mask. • Mask selection • Mask position • Use C-E hand configuration • Can use jaw thrust • Have firm seal •Do not block anterior neck Insert Laryngoscope	appropriate dosages of drugs to a pediatric and neonatal patient mannequin simulator: • Sedative • Paralytic • Cardiovascular 3. Be able to perform each step of intubating a neonatal and pediatric patient in a simulated context using the correct method on a pediatric and neonatal patient mannequin simulator. 4. Be able to ventilate a pediatric and neonatal patient mannequin simulator. 5. Be able to assess clinical stability in pediatric and neonatal patient mannequin simulators.	pediatric and neonatal patient mannequin simulator • Sedative • Paralytic • Cardiovascular 3. Be able to perform each step of intubating a neonatal and pediatric patient in a simulated context using the correct method on a pediatric and neonatal patient mannequin simulator. 4. Correctly ventilates a pediatric and neonatal patient mannequin simulator. 5. Correctly assesses clinical stability in pediatric and neonatal patient mannequin simulators.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	insert to just past cords • If ETT balloon, balloon just past cords Confirm ETT placement. • Verbalize “see tube pass through cords.” • Auscultation of breath sounds. • CO2 detector. • Post intubation chest x-ray. Recognize Misplacement of ETT. • Identify Esophageal Intubation • Identify Right Main Stem Intubation Manage Esophageal Intubation. • Recognize • Remove ETT ≤ 10 sec • Re-start ETT ≤ 15 sec Placement Manage Right Main Stem Intubation. • Recognize ≤ 10 sec • Pull back ETT ≤ 15 sec 3. Understands how to ventilate a pediatric and neonatal patient.			Blade. Place Endotracheal Tube. Determine how deep to insert the tube: • Use Broselow tape • 3X Tube size • On end of ETT lines, insert to just past cords • If ETT balloon, balloon just past cords Confirm ETT placement. • Verbalize “see tube pass through cords.” • Auscultation of breath sounds. • CO2 detector. • Post intubation chest x-ray. Recognize Misplacement of ETT. • Identify Esophageal Intubation • Identify Right Main Stem Intubation Manage		

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	• Rate • Volume 4. Knows how to determine if a pediatric and neonatal patient is clinically stable: • Normal vital signs for neonatal patients • Normal vital signs for pediatric patient by age			Esophageal Intubation. • Recognize • Remove ETT ≤ 10 sec • Re-start ETT ≤ 15 sec Placement Manage Right Main Stem Intubation. • Recognize ≤ 10 sec • Pull back ETT ≤ 15 sec 4. Be able to ventilate to support a pediatric and neonatal patient's breathing. 5. Be able to assess clinical stability in pediatric and neonatal patients.		
Factual	**Instruments & Supplies** 1. Identify and describe the function the following medical instruments & supplies: • Endotracheal Tube • Stylette • Laryngoscope • Suction	**Instruments & Supplies** 1. Identify and describe the function the listed medical instruments & supplies on a written test.	**Instruments & Supplies** 1. Correctly identify and describe the function the listed medical instruments & supplies on a written test.	**Instruments & Supplies** 1. Be able to identify the location of and select the following instruments & supplies: • Endotracheal	**Instruments & Supplies** 1. Demonstrate the ability to locate and select the listed instruments & supplies in a simulated context.	**Instruments & Supplies** 1. Correctly demonstrates the ability to locate and select the listed instruments & supplies. 2. Correctly demonstrates ability

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	• Ambu bag-valve-mask • IV Catheter • IV Fluids • Broselow Tape • pCO2 Detector (litmus paper) • Tape • 10cc syringe 2. Determine the size of Endotracheal tube: • (16 + age)/4 • (age/4) + 4 • Broselow tape • Size of pinky finger after 1y/0 3. Determine size of laryngoscope blade: • Use Broselow tape • Measure from tragus to cricoid membrane • Better too long vs. too short 4. Determine the best mask for pediatric and neonatal patients: • Fits from base of chin to mid-bridge of nose • Cushion helps make better seal •Use best fit • Adjust based on size as needed	2. Determine the size of Endotracheal tube given information in a case study on a written test. 3. Determine size of laryngoscope blade given information in a case study on a written test. 4. Indicate the best mask for pediatric and neonatal patients on a written test.	2. Correctly determines the size of Endotracheal tube given information in a case study on a written test. 3. Correctly determines size of laryngoscope blade given information in a case study on a written test. 4. Correctly indicates the best mask for pediatric and neonatal patients on a written test.	Tube • Stylette • Laryngoscope • Suction • Ambu bag-valve-mask • IV Catheter • IV Fluids • Broselow Tape • pCO2 Detector (litmus paper) • Tape • 10cc syringe 2. Be able to appropriately implement the following medical instruments & supplies: • Endotracheal Tube • Stylette • Laryngoscope • Suction • Ambu bag-valve-mask • IV Catheter • IV Fluids • Broselow Tape • pCO2 Detector (litmus paper) • Tape • 10cc syringe	2. Demonstrates ability to appropriately implement the listed medical instruments & supplies in a simulated context.	to appropriately implement the listed medical instruments & supplies in a simulated context.
Factual	**Equipment** 1. Know how to use suction.	**Equipment** 1. Describe how to use suction on a	**Equipment** 1. Correctly describes how to use suction	**Equipment** 1. Be able to use suction.	**Equipment** 1. Be able to use suction in a simulated	**Equipment** 1. Correctly uses suction in a simulated context

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	2. Know how to use ventilator. 3. Know how to use vitals monitor to assess heart rate, respiration rate and SpO2 levels.	written test. 2. Describe how to use ventilator on a written test. 3. Describe how to use vitals monitor to assess heart rate, respiration rate and SpO2 levels on a written test.	on a written test. 2. Correctly describes how to use ventilator on a written test. 3. Describes how to use vitals monitor to assess heart rate, respiration rate and SpO2 levels on a written test.	2. Be able to use ventilator. 3. Be able to use vitals monitor to assess heart rate, respiration rate and SpO2 levels.	context with pediatric and neonatal patient mannequin simulators. 2. Be able to use ventilator in a simulated context with pediatric and neonatal patient mannequin simulators. 3. Be able to use vitals monitor to assess heart rate, respiration rate and SpO2 levels in a simulated context with pediatric and neonatal patient mannequin simulators.	with pediatric and neonatal patient mannequin simulators. 2. Correctly uses ventilator in a simulated context with pediatric and neonatal patient mannequin simulators. 3. Correctly uses vitals monitor to assess heart rate, respiration rate and SpO2 levels in a simulated context with pediatric and neonatal patient mannequin simulators.
Conceptual	**Physiological** 1. Distinguish between the primary conditions indicating the need for pediatric and neonatal intubation: • Decreased Oxygenation. • Decreased ventilation (not clearing CO2). • Decreased mental	**Physiology** 1. Distinguish between the primary conditions indicating the need for pediatric and neonatal intubation on a written test.	**Physiology** 1. Correctly identify the primary conditions indicating the need for pediatric and neonatal intubation on a written test.	**Physiology** N/A	**Physiology** N/A	**Physiology** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	status causes inability to protect airway. • Other cause of inability to protect airway.					
Conceptual	**Clinical** 1. Understand the relevant symptomology for performing a differential diagnosis (DDx) for pediatric and neonatal patients experiencing signs that they require intubation: • Identify need for intubation over other airway management interventions. • Identify need for intubation over other respiratory management. 2. Distinguish the primary conditions indicating the need for pediatric and neonatal intubation: • Decreased Oxygenation. • Decreased ventilation (not clearing CO2). • Decreased mental status causes inability to protect airway. • Other cause of inability to protect airway.	**Clinical** 1. Perform Differential Diagnosis (DDx) from case-based information on a written test. 2. Identify primary conditions indicating the need for pediatric and neonatal intubation on a written test. 3. Distinguish between the clinical indicators for esophageal intubation from case-based information on a written test. 4. Distinguish between the clinical indicators for right main stem	**Clinical** 1. Correctly identify the need for intubation in pediatric and neonatal patients given clinical conditions from case-based information on a written test. 2. Correctly identify primary conditions indicating the need for pediatric and neonatal intubation on a written test. 3. Correctly distinguish between the clinical indicators for esophageal intubation from case-based information on	**Clinical** 1. Be able to examine a pediatric and neonatal patient to perform DDx: • Identify need for intubation over other airway management interventions. • Identify need for intubation over other respiratory management. 2. Be able to examine a pediatric and neonatal patient to confirm endotracheal intubation. 3. Be able to examine a pediatric and neonatal patient to assess esophageal intubation. 4. Be able to examine a pediatric and	**Clinical** 1. Demonstrate the ability to examine a pediatric and neonatal patient and perform DDx in a simulated context with pediatric and neonatal mannequin simulators. 2. Be able to examine a pediatric and neonatal patient to confirm endotracheal intubation in a simulated context with pediatric and neonatal mannequin simulators. 3. Be able to examine a pediatric and neonatal patient to assess esophageal intubation in a	**Clinical** 1. Correctly examines a pediatric and neonatal patient and performs DDx in a simulated context with pediatric and neonatal mannequin simulators. 2. Correctly examines a pediatric and neonatal patient to confirm endotracheal intubation in a simulated context with pediatric and neonatal mannequin simulators. 3. Correctly examines a pediatric and neonatal patient to assess esophageal intubation in a simulated context with pediatric and neonatal mannequin simulators. 4. Correctly examines a pediatric and neonatal patient to assess right main

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	3. Distinguish between the clinical indicators for esophageal intubation. 4. Distinguish between the clinical indicators for right main stem intubation. 5. Understands how to determine clinical stability in pediatric and neonatal patients.	intubation from case-based information on a written test. 5. Evaluates clinical stability in pediatric and neonatal patients from information given in a case study on a written test.	a written test. 4. Correctly distinguish between the clinical indicators for right main stem intubation from case-based information on a written test. 5. Correctly evaluates clinical stability in pediatric and neonatal patients from information given in a case study on a written test.	neonatal patient to assess right main stem intubation. 5. Be able to evaluate clinical stability in pediatric and neonatal patients.	simulated context with pediatric and neonatal mannequin simulators. 4. Be able to examine a pediatric and neonatal patient to assess right main stem intubation in a simulated context with pediatric and neonatal mannequin simulators. 5. Be able to evaluate clinical stability in a simulated context with pediatric and neonatal mannequin simulators.	stem intubation in a simulated context with pediatric and neonatal mannequin simulators. 5. Correctly evaluates clinical stability in a simulated context with pediatric and neonatal mannequin simulators.
Conceptual	**Medication** 1. Differentiate dose requirements by weight for the medications used in pediatric and neonatal intubation: • Etomidate (0.3-0.6 mg/kg) • Versed (0.05-0.1	**Medication** 1. Indicate the dose requirements by weight for the medications used in pediatric and neonatal	**Medication** 1. Correctly indicate the dose requirements for the medications used in pediatric and neonatal	**Medication** Be able to adjust medication dosages for optimal clinical effect in a pediatric and neonatal patient requiring intubation.	**Medication** Be able to adjust medication dosages for optimal clinical effect in a simulated context with pediatric and	**Medication** Correctly adjusts medication dosages for optimal clinical effect in a simulated context with pediatric and neonatal mannequin simulators.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	mg/kg) • Ketamine (1-2mg/kg) • Succinylcholine (1-2 mg/kg) • Atropine (0.2 mg/kg) 2. Understand the effects of dosing for optimal clinical effect for each medication type.	intubation on a written test. 2. Indicate how to adjust dosages of medications given information about clinical effects in a case study on a written test.	intubation on a written test. 2. Correctly indicates how to adjust dosages of medications given information about clinical effects in a case study on a written test.		neonatal mannequin simulators.	
Practical	**Clinical** N/A	**Clinical** N/A	**Clinical** N/A	**Clinical** 1. Be able to examine pediatric and neonatal patients to assess indicators of need for airway management: • Mouth • Nose; Nasal Flaring • Respiratory effort • Retractions • Apnea • Cyanosis • Pulse 2. Be able to examine pediatric and neonatal patients to assess indicators of need for intubation:	**Clinical** 1. Examine a patient to assess indicators of need for airway management in a simulated context with pediatric and neonatal mannequin simulators. 2. Examine a patient to assess indicators of need for intubation in a simulated context with pediatric and neonatal mannequin simulators.	**Clinical** 1. Correctly examines a patient to assess indicators of need for airway management in a simulated context with pediatric and neonatal mannequin simulators. 2. Correctly examines a patient to assess indicators of need for intubation in a simulated context with pediatric and neonatal mannequin simulators. 3. Correctly examines a patient to perform DDx and determine airway management strategy in a simulated context

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
				• Failure to Ventilate. • Failure to Oxygenate. • Failure to protect airway. • Failure to maintain patent airway. • Significant hemodynamic instability. • Operative needs. 3. Be able to examine a pediatric and neonatal patient to perform DDx: • Identify need for intubation over other airway management interventions. • Identify need for intubation over other respiratory management. 4. Be able to intubate pediatric and neonatal patients: • Uses appropriate instruments, supplies, equipment	3. Examine a patient to perform DDx and determine airway management strategy in a simulated context with pediatric and neonatal mannequin simulators. 4. Intubate patients in a simulated context with pediatric and neonatal mannequin simulators. 5. Examine a patient to confirm endotracheal intubation in a simulated context with pediatric and neonatal mannequin simulators. 6. Examine a patient to assess esophageal intubation in a simulated context with pediatric and neonatal mannequin simulators.	with pediatric and neonatal mannequin simulators. 4. Correctly intubates patients in a simulated context with pediatric and neonatal mannequin simulators. 5. Correctly examines a patient to confirm endotracheal intubation in a simulated context with pediatric and neonatal mannequin simulators. 6. Correctly examines a patient to assess esophageal intubation in a simulated context with pediatric and neonatal mannequin simulators. 7. Correctly examines a patient to assess right main stem intubation in a simulated context with pediatric and neonatal mannequin simulators. 8. Correctly assesses clinical

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
				• Completes all steps in appropriate sequence 5. Be able to examine a pediatric and neonatal patient to confirm endotracheal intubation. 6. Be able to examine a pediatric and neonatal patient to assess esophageal intubation. 7. Be able to examine a pediatric and neonatal patient to assess right main stem intubation. 8. Be able to assess clinical stability in a pediatric and neonatal patient.	simulated context with pediatric and neonatal mannequin simulators. 7. Examine a patient to assess right main stem intubation in a simulated context with pediatric and neonatal mannequin simulators. 8. Assess clinical stability in a patient in a simulated context with pediatric and neonatal mannequin simulators.	stability in a patient in a simulated context with pediatric and neonatal mannequin simulators.
Practical	**Medication** N/A	**Medication** N/A	**Medication** N/A	**Medication** 1. Be able to identify and secure the following medications: • Etomidate	**Medication** 1. Administer drugs through IV catheter in a simulated context with pediatric and	**Medication** 1. Correctly administers drugs through IV catheter in a simulated context with pediatric and neonatal

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
				• Versed • Ketamine • Succinylcholine • Atropine 2. Be able to administer the appropriate dosages and drugs through IV catheter in pediatric and neonatal patients. 3. Be able to select the appropriate drugs, dosages, administration routes and time sequences for pediatric and neonatal patients. 4. Be able to evaluate the clinical effects of selected drugs and dosages in pediatric and neonatal patients. 5. Be able to adjust medication doses and apply appropriate time	neonatal mannequin simulators. 2. Administer adjustments to medication doses to gain clinical effect in a simulated context with pediatric and neonatal mannequin simulators. 3. Select the appropriate drugs, dosages, administration routes and time sequences for pediatric and neonatal intubation in a simulated context with pediatric and neonatal mannequin simulators. 4. Evaluate the clinical effects of selected drugs and dosages in a simulated context with pediatric and neonatal	mannequin simulators. 2. Correctly administers adjustments to medication doses to gain clinical effect in a simulated context with pediatric and neonatal mannequin simulators. 3. Correctly selects the appropriate drugs, dosages, administration routes and time sequences for pediatric and neonatal intubation in a simulated context with pediatric and neonatal mannequin simulators. 4. Correctly evaluates the clinical effects of selected drugs and dosages in a simulated context with pediatric and neonatal mannequin simulators. 5. Correctly adjusts medication doses and apply appropriate time sequences to gain

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
				sequences to gain optimal clinical effect in pediatric and neonatal patients.	mannequin simulators. 5. Adjust medication doses and apply appropriate time sequences to gain optimal clinical effect in a simulated context with pediatric and neonatal mannequin simulators.	optimal clinical effect in a simulated context with pediatric and neonatal mannequin simulators.
Practical	**Health Metrics** Knows how to evaluate relevant health metrics for assessing the patient's physical and physiological status: • Respiratory status • Integrity of Airway	**Health Metrics** Evaluate appropriate health metrics to assess respiratory and/or airway compromise in neonatal and pediatric patients in a simulated context with pediatric and neonatal mannequin simulators.	**Health Metrics** Correctly evaluates appropriate health metrics to assess respiratory and/or airway compromise in neonatal and pediatric patients in a simulated context with pediatric and neonatal mannequin simulators.	**Health Metrics** Knows how to examine and indicate patient's physical and physiological status: • Respiratory status • Integrity of Airway	**Health Metrics** Examines and indicates pediatric and neonatal patients' physical and physiological status in a simulated context with pediatric and neonatal mannequin simulators.	**Health Metrics** Correctly examines and indicates pediatric and neonatal patients' physical and physiological status in a simulated context with pediatric and neonatal mannequin simulators.
Analytical	N/A	N/A	N/A	**Clinical** 1. Identify treatment	**Clinical** 1. Identify treatment	**Clinical** 1. Identify treatment effects in a simulated

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
				effects: • Decreased retractions • Decreased cyanosis • Decreased respiratory effort • Decreased nasal flaring • Reduced Apnea • Improved respiration 2. Identify effects of clinical mismanagement: • Absent positive treatment effects	effects in a simulated context with pediatric and neonatal mannequin simulators. 2. Identify effects of clinical mismanagement in a simulated context with pediatric and neonatal mannequin simulators.	context with pediatric and neonatal mannequin simulators. 2. Identify effects of clinical mismanagement in a simulated context with pediatric and neonatal mannequin simulators.
Analytical	N/A	N/A	N/A	**Procedural** 1. Identify challenges of airway management for pediatric and neonatal patients. 2. Understand the correct administration of medications. 3. Know the step-by-step sequence for intubating pediatric and neonatal patients.	**Procedural** 1. Respond to the challenges of airway management for pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 2. Administer medications as needed for airway management (intubation) in	**Procedural** 1. Respond to the challenges of airway management for pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 2. Correctly administers medications as needed for airway management (intubation) in pediatric and neonatal patients in a simulated context with pediatric and

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
				4. Know the correct ventilation requirements for pediatric and neonatal patients. 5. Understand the stabilization course for intubated pediatric and neonatal patients.	pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 3. Intubate as needed for airway management in pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 4. Ventilate intubated pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 5. Stabilize intubated pediatric and neonatal	neonatal mannequin simulators. 3. Correctly intubates as needed for airway management in pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 4. Correctly ventilates intubated pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators. 5. Adequately stabilizes intubated pediatric and neonatal patients in a simulated context with pediatric and neonatal mannequin simulators.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
					patients in a simulated context with pediatric and neonatal mannequin simulators.	

Appendix 4: Cholinergic Crisis Task Analysis

TASK STEPS: RECOGNITION AND CLINICAL MANAGEMENT OF CHOLINERGIC CRISIS
Nerve Agent Exposure: Tabun(GA); GB(Sarin); GD(Soman); GF; VX) – liquid/gas

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MACW: Sidell FR, Newmark J, McDonough JH. Nerve Agents. Medical Aspects of Chemical Warfare. Tuorinsky SD. Ed. 2008. Office of the Surgeon General, Department of the Army, United States of America. Pages 155-205.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
Factual	**Anatomy** Understand the functions of the Gastrointestinal, Respiratory, Cardiovascular, Neurological, Endocrine, Ophthalmological, and Musculoskeletal Systems.	**Anatomy** Identify the functions of the Gastrointestinal, Respiratory, Cardiovascular, Neurological, Endocrine, Ophthalmological, and Musculoskeletal Systems on a written test.	**Anatomy** Correctly identifies the functions of the Gastrointestinal, Respiratory, Cardiovascular, Neurological, Endocrine, Ophthalmological, and Musculoskeletal Systems.	**Anatomy** N/A	**Anatomy** N/A	**Anatomy** N/A
Factual	**Physiology** 1. The normal action of the enzyme acetylcholinesterase (AChE) to control the transmission of acetylcholine across the synaptic cleft. 2. The effect of blocking AChE on the nervous system.	**Physiology** 1. Identify the normal function of the enzyme acetylcholinesterase is to breakdown (hydrolyze) the chemical messenger (neurotransmitter) acetylcholine (ACh) in the post-synaptic membranes, thereby	**Physiology** 1. Correctly explains the normal function of the enzyme acetylcholinesterase in controlling the neuron signal processing of the nervous system. 2. Correctly explains how nerve agents	**Physiology** N/A	**Physiology** N/A	**Physiology** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	The parts of the human body affected by excessive acetylcholine accumulation: Eye, nose (glands), mouth (glands), respiratory tract, gastrointestinal tract, cardiac muscle, sweat glands, skeletal muscle, central nervous system.	controlling the neuron signal processing of the nervous system in a written test. 2. Describe how nerve agents block the enzyme AChE in a written test.	interfere with AChE leading to cholinergic crisis.			
Factual	**Clinical Knowledge** 1. Know how to assess the patient's physical and physiological status.	**Clinical Knowledge** 1. Describe the physical and physiological signs to look for during patient assessment in written test. 2. Indicate on a written test the information to request from a conscious patient during clinical assessment. 3. On a written test, list the areas where physical examination will provide indicators of cholinergic crisis.	**Clinical Knowledge** 1. Correctly describe the primary physical and physiological signs to look for during patient assessment to identify nerve agent exposure: • Miosis • Copious secretions • Generalized muscular fasciculations • Respiratory distress • Cyanosis • Convulsions 2. Correctly indicates the following information to request from a conscious patient during clinical assessment:	**Clinical Skills** 1. Be able to examine the patient to assess indicators of cholinergic crisis: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse	**Clinical Skills** 1. Demonstrate the ability to examine the patient and assess indicators of cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse	**Clinical Skills** 1. Correctly examines the patient to assess indicators of cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			• Pain • GI/Urinary distress • Difficulty breathing • Fatigue • Muscle control • Other concerns 3. Correctly indicates the areas where physical examination will provide indicators of cholinergic crisis: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse			
Factual	**Medication Knowledge** 1. Know the drugs, dosages, administration routes and time sequences for the management of cholinergic crisis. 2. Understand the purpose of each drug used in the management of cholinergic crisis and their respective expected clinical effects.	**Medication Knowledge** 1. On a written test, identify the drugs, dosages, administration routes and time sequences for the management of cholinergic crisis. 2. Describe the purpose of each drug used in the management of cholinergic crisis and their respective expected clinical effects on a written test.	**Medication Knowledge** 1. Correctly identifies the drugs, dosages, administration routes and time sequences for the management of cholinergic crisis: Pre-treatment • Pyridostigmine Bromide (30mg tablet orally q 8 hours) (pre-treatment) Treatment • Mark1 Kit Auto Injector (Atropine, 2mg / 2PAMCL, 300mg) IM 1st injector	**Medication Skills** 1. Be able to use the following: • Mark1 Kit Auto Injector • ATNNA Auto Injector • CANA Auto Injector 2. Be able to place an IV catheter. 3. Be able to administer drugs through IV catheter. 4. Be able to administer atropine ophthalmic ointment.	**Medication Skills** 1. Demonstrate the ability to use the following in a simulated context: • Mark1 Kit Auto Injector • ATNNA Auto Injector • CANA Auto Injector 2. Be able to place an IV catheter in a simulated context. 3. Be able to administer drugs through IV catheter in a simulated context.	**Medication Skills** 1. Correctly uses each of the following in a simulated context: • Mark1 Kit Auto Injector • ATNNA Auto Injector • CANA Auto Injector 2. Correctly places an

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • ATNAA Auto Injector (Atropine, 2.1mg / 2PAMCL, 600mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • CANA) Auto Injector (Diazepam,10mg) IM 1st injector if patient receives 3 ATNAA/ Mark1 Kits Auto Injectors 2nd/3rd injectors as needed for seizing patient • Atropine Ophthalmic Ointment (topical); 0.5” strip in pocket of lower eyelid at Level 2 treatment location 2. Correctly describe the purpose of each		4. Be able to administer atropine ophthalmic ointment (topical); 0.5” strip in pocket of lower eyelid of a patient mannequin simulator.	IV catheter in a simulated context. 3. Correctly administers drugs through IV catheter in a simulated context. 4. Correctly administers atropine ophthalmic ointment (topical); 0.5” strip in pocket of lower eyelid of a patient mannequin simulator.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			drug used in the management of cholinergic crisis and their respective expected clinical effects on a written test: • Pyridostigmine Bromide – Shields AChE enzyme from full effects of GD to enhance the effectiveness of treatment after GD exposure. • Atropine – Dry secretions, reduce bronchoconstriction, decrease gastrointestinal motility • 2PAMCL – Remove the nerve agent (except GD) from the enzyme acetylcholinesterase. • Diazepam – Control convulsions. • Atropine ophthalmological ointment – Relieve eye symptoms.			
Factual	**Health Metrics** Understand relevant health metrics for assessing the patient's physical and physiological	**Health Metrics** Indicate on a written test which health metrics to assess for a patient who may be experiencing	**Health Metrics** Indicate the following health metrics: • Pupil Size • Respiratory status • Muscle control	**Health Metrics** N/A	**Health Metrics** N/A	**Health Metrics** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	status. Understand relevant time sequence for exposure in assessing the patient's physical and physiological status during cholinergic crisis.	cholinergic crisis. Indicate on a written test relevant time sequence for exposure in assessing the patient's physical and physiological status during cholinergic crisis.	• Neurological status • Volume of secretions • Heart rate Indicate the time sequences for: • Vapor • Liquid			
Factual	**Situational Knowledge** 1. Identify exposure agent by using detection device(s) and situational cues. 2. Identify exposure agent by using situational cues. 3. Knows the transfer of care sequence for responding to a cholinergic crisis.	**Situational Knowledge** 1. Indicate the meaning of detection results for each of the detection device(s) to assess exposure agent on a written test. 2. Identifies other situational cues for assessing exposure agent on a written test. 3. Describes the transfer of care sequence for responding to a cholinergic crisis on a written test.	**Situational Knowledge** 1. Correctly indicates the meaning of the detection result for each detection device(s) to identify the exposure agent. 2. Identifies other situational cues for assessing exposure agent including: mass casualties, patient symptomology such as the onset of symptoms, localized or general reactions, initial symptoms, and time progression of symptoms. 3. Correctly indicates transfer of care sequence: • Self-care • Buddy care	**Situational Skills** N/A	**Situational Skills** N/A	**Situational Skills** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			• Level 1 Care (Medic, Combat Lifesaver) • Level 2 Care			
Factual	**Procedural Knowledge** 1. Describe the patient management strategy for cholinergic crisis: • Self-protection • Antidote • Airway • Breathing • Circulation • Drugs • Decontamination 2. Describe the de-contamination protocol for managing a cholinergic crisis: • Remove contaminated clothing and gear • Decontaminate exposed skin	**Procedural Knowledge** 1. Describe patient management strategy for cholinergic crisis: Self-protection • Pre-treatment w/ Pyridostigmine Bromide • Don Mission-Oriented Protective Posture (MOPP) Level IV Antidote Treatment • Mark 1 Kit (atropine and pralidoxime chloride auto-injector) • ATNAA (antidote treatment nerve agent auto-injector; atropine and pralidoxime chloride auto-injector) • CANA (convulsant antidote for nerve agent; diazepam auto-injector) Airway • Suction • Position patient • Bag-valve-mask airway	**Procedural Knowledge** 1. Correctly describe patient management strategy for cholinergic crisis: Self-protection • Pre-treatment w/ Pyridostigmine Bromide • Don Mission-Oriented Protective Posture (MOPP) Level IV Antidote Treatment • Mark 1 Kit (atropine and pralidoxime chloride auto-injector) • ATNAA (antidote treatment nerve agent auto-injector; atropine and pralidoxime chloride auto-injector) • CANA (convulsant antidote for nerve agent; diazepam auto-injector) Airway • Suction • Position patient • Bag-valve-mask airway	**Procedural Skills** 1. Be able to don Mission-Oriented Protective Posture (MOPP) Level IV 2. Be able to administer • Mark 1 Kit • ATNAA • CANA 3. Be able to secure the patient's airway by performing: • Suction • Patient positioning • Bag-valve-mask • Intubation 4. Be able to ventilate and implement RDIC to support the patient's breathing 5. Be able to perform each step of the decontamination protocol: • Remove contaminated clothing and gear	**Procedural Skills** 1. Be able to don Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context 2. Be able to administer each of the following to a patient mannequin simulator • Mark 1 Kit • ATNAA • CANA 3. Be able to perform each of the following skills on a patient mannequin simulator:: • Suction • Patient positioning • Bag-valve-mask • Intubation 4. Be able to ventilate and implement RDIC using a patient mannequin simulator 5. Be able to perform	**Procedural Skills** 1. Correctly dons Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context 2. Correctly administers each of the following to a patient mannequin simulator • Mark 1 Kit • ATNAA • CANA 3. Correctly performs each of the following skills on a patient mannequin simulator: • Suction

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
		• Intubation Breathing • Assessment • Ventilation • RDIC Circulation • Assessment Drugs • Pyridostigmine Bromide (30mg tablet) (pre-treatment) • Mark1 Kit Auto Injector (Atropine, 2mg / 2PAMCL, 300mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • ATNAA Auto Injector (Atropine, 2.1mg / 2PAMCL, 600mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • CANA Auto Injector (Diazepam,10mg)	• Intubation Breathing • Assessment • Ventilation • RDIC Circulation • Assessment Drugs • Pyridostigmine Bromide (30mg tablet) (pre-treatment) • Mark1 Kit Auto Injector (Atropine, 2mg / 2PAMCL, 300mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • ATNAA Auto Injector (Atropine, 2.1mg / 2PAMCL, 600mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • CANA Auto Injector (Diazepam,10mg)	• Decontaminate exposed skin • Apply reactive skin decontamination lotion (RSDL) • Irrigate with large amounts of water • Apply M291 SDK • Clean w/ soap & water • Apply M295 • Apply 0.5% hypochlorite solution	each step of the decontamination protocol in a simulated context using the correct method on a patient mannequin simulator or standardized patient: • Remove and disposition contaminated clothing and gear. • Decontaminate exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Apply reactive skin decontamination lotion (RSDL) • Irrigate with large amounts of water • Apply M291 SDK • Clean w/ soap & water • Apply M295 • Apply 0.5% hypochlorite solution	• Patient positioning • Bag-valve-mask • Intubation 4. Correctly ventilates and implements RDIC using a patient mannequin simulator 5. Be able to perform each step of the decontamination protocol in a simulated context using the correct method on a patient mannequin simulator or standardized patient: • Remove and disposition contaminated clothing and gear.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
		IM 1st injector if patient receives 3 ATNAA/ Mark1 Kits Auto Injectors 2nd/3rd injectors as needed for seizing patient • Atropine Ophthalmic Ointment (topical); 0.5” strip in pocket of lower eyelid at Level 2 treatment location Decontamination Describe decontam-ination protocol: • Remove contaminated clothing and gear (order of removal, how to remove, how to dispose) • Decontaminate exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Apply reactive skin decontamination lotion (RSDL) (how much, how applied, sequence)	IM 1st injector if patient receives 3 ATNAA/ Mark1 Kits Auto Injectors 2nd/3rd injectors as needed for seizing patient • Atropine Ophthalmic Ointment (topical); 0.5” strip in pocket of lower eyelid at Level 2 treatment location Decontamination Describe decontam-ination protocol: • Remove contaminated clothing and gear (order of removal, how to remove, how to dispose) • Decontaminate exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Apply reactive skin decontamination lotion (RSDL) (how much, how applied, sequence)			• Decontaminate exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Apply reactive skin decontamination lotion (RSDL) • Irrigate with large amounts of water • Apply M291 SDK • Clean w/ soap & water • Apply M295 • Apply 0.5% hypochlorite solution

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
		• Irrigate with large amounts of water (how applied, drainage, sequence) • M291 SDK (how much, how applied, sequence) • Soap & water • M295 (how much, how applied, sequence) • 0.5% hypochlorite solution (how much, how applied, sequence)	• Irrigate with large amounts of water (how applied, drainage, sequence) • M291 SDK (how much, how applied, sequence) • Soap & water • M295 (how much, how applied, sequence) • 0.5% hypochlorite solution (how much, how applied, sequence)			
Factual	**Instruments & Supplies** Identify and describe the function the following medical instruments & supplies: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	**Instruments & Supplies** Identify and describe the function the following medical instruments & supplies in a written test: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	**Instruments & Supplies** Correctly identify and describe the function the following medical instruments & supplies: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	**Instruments & Supplies** 1. Be able to identify the location of instruments & supplies. 2. Be able to appropriately select and implement the following medical instruments & supplies: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	**Instruments & Supplies** 1. Demonstrate the ability to locate instruments & supplies. 2. Demonstrates ability to appropriately select and implement the following medical instruments & supplies in a simulated context: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter	**Instruments & Supplies** 1. Correctly demonstrates the ability to locate instruments & supplies. 2. Correctly demonstrates ability to appropriately select and implement the following medical instruments & supplies in a simulated

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
					• IV Fluids • Tape	context: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape
Factual	**Equipment** 1. Discriminate between positive detection alarm indicators or color indicators for the following detection devices: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm)	**Equipment** 1. Indicate what the alarm indicators or color indicators for the following detection devices signify: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent	**Equipment** 1. Correctly indicate what the alarm indicators or color indicators for the following detection devices signify: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm)	**Equipment** 1. Be able to use the following detection devices: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper	**Equipment** 1. Correctly uses the following detection devices in a classroom, lab, or field exercise: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper	**Equipment** 1. Correctly uses the following detection devices in a classroom, lab, or field exercise: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	• M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Know to select and don Mission-Oriented Protective Posture (MOPP) Level IV.	Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Identify protection as Mission-Oriented Protective Posture (MOPP) Level IV on written test.	• M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Correctly identify protection as Mission-Oriented Protective Posture (MOPP) Level IV.	• M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Be able to don Mission-Oriented Protective Posture (MOPP) Level IV.	• M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Demonstrates ability to don Mission- Oriented Protective Posture (MOPP) Level IV.	Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
						Agent Detector • M272 (in water) 2. Correctly dons Mission-Oriented Protective Posture (MOPP) Level IV.
Conceptual	**Physiological** 1. Distinguish other possible exposures leading to similar patient symptomology. 2. Distinguish other possible medical conditions leading to similar patient symptomology.	**Physiology** 1. Indicate other possible exposures leading to similar patient symptomology on a written test: 2. Indicate other possible medical conditions leading to similar patient symptomology in a written test.	**Physiology** 1. Correctly identify other possible exposures: • ***Vesicants***: cough, erythema, blisters, conjunctivitis • ***Pulmonary Agents***: airway irritation, shortness of breath (delayed onset), eye irritation, chest tightness • ***Cyanide***: pulmonary edema (secretions, cough difficulty breathing), seizures, respiratory arrest, cardiac arrest • ***Riot:*** respiratory discomfort (coughing, difficulty breathing, shortness	**Physiology** N/A	**Physiology** N/A	**Physiology** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			of breath), burning pain on mucous membranes, skin and eyes • ***Respiratory Irritants***: respiratory discomfort (coughing, wheezing, shortness of breath, chest tightness), irritation to eyes, nose, upper airway. 2. Correctly identify other possible medical conditions leading to similar patient symptomology: • Upper respiratory infections • Viral infection (GI) • Medication toxicities - opiates			
Conceptual	**Clinical Knowledge** 1. Understand the relevant symptomology for performing a differential diagnosis (DDx) for patient experiencing signs of a cholinergic crisis. • Identify other possible exposures. • Identify other possible medical conditions	**Clinical Knowledge** 1. Perform Differential Diagnosis (DDx) from case-based information on a written test. • Identify other possible exposures. • Identify other possible medical conditions 2. Identify primary combination of nerve	**Clinical Knowledge** 1. Correctly identify the following clinical conditions from case-based information on a written test: • Nerve agent • Vesicant • Pulmonary Agents • Riot • Cyanide • Respiratory Irritant • Upper respiratory	**Clinical Skills** 1. Be able to examine the patient to perform DDx: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse • Skin • Pain level/location • Fever	**Clinical Skills** 1. Demonstrate the ability to examine the patient and perform DDx in a simulated context with a mannequin simulator or a standardized patient: • Eyes • Mouth • Nose • Respiratory effort • Muscle control	**Clinical Skills** 1. Correctly examines the patient to assess indicators of cholinergic crisis in a simulated context with a mannequin simulator or a

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	2. Distinguish the primary combination of nerve agent exposure indicators. 3. Distinguish between the clinical indicators for vapor or liquid exposure. 4. Distinguish between the clinical indicators for the extent of poisoning	agent exposure indicators on a written test. 3. Distinguish between the clinical indicators for vapor or liquid exposure from case-based information on a written test. 4. Distinguish between the clinical indicators for the extent of poisoning from case-based information on a written test.	infections • Viral infection (GI) • Medication toxicities - opiates 2. Correctly identify primary combination of nerve agent exposure indicators: • Miosis • Copious secretions • Generalized muscular fasciculations • Respiratory distress • Cyanosis • Convulsions 3. Correctly determines vapor or liquid exposure: ***Vapor*** – Symptomatic onset within seconds to minutes; Eye, Respiratory, Secretory, Neuromuscular, Gastrointestinal ***Liquid*** – Symptomatic onset within 10 minutes to 18 hours; Muscle twitching and sweating at site of exposure,		• Pulse • Skin • Pain level/location • Fever	standardized patient: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse • Skin • Pain level/location • Fever

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			Nausea/Vomiting, Weakness, Respiratory, Gastrointestinal, Neurological ***Both*** – Convulsions, Apnea 4. Correctly determines the extent of poisoning • ***Mild*** – Miosis, Headache, Rhinorrhea, Salivation, Dyspnea, Bronchoconstriction • ***Severe*** – Symptoms progress to more than one organ system. Respiratory Cessation, Neuromuscular Symptoms			
Conceptual	**Medication Knowledge** 1. Differentiate dose requirements by age for the medications used in the management of cholinergic crisis.	**Medication Knowledge** 1. Indicate the dose requirements by age for the medications used in the management of cholinergic crisis on a written test.	**Medication Knowledge** 1. Correctly indicate the dose requirements by age for the medications used in the management of cholinergic crisis on a written test. • Atropine: 2mg/dose (>12 years); 1mg/dose (6-12	**Medication Knowledge** N/A	**Medication Knowledge** N/A	**Medication Knowledge** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			years); 0.5mg/dose (age 1-5 years); 0.25mg/dose (<1 years) • Praladoxime Chloride (25/50mg/kg; 2000mg max for all): 3 injectors (>12 years); 2 injectors (6-12 years); 1 injector (age 1-5 years); NA (<1 years) • Diazepam: 10mg/dose (>12 years); 0.3mg/kg (6-12 years); 0.5mg/kg (age <6 years)			
Practical	**Clinical Knowledge** 1. Know how to examine and assess the patient's physical and physiological status. 2. Perform a differential diagnosis (DDx) for patient experiencing signs of a cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient. • Identify other	**Clinical Knowledge** 1. Request information from a conscious patient, and assess the physical and physiological signs of a patient in a simulated context with a mannequin simulator or a standardized patient. 2. Perform Differential Diagnosis (DDx) for a patient in a simulated context	**Clinical Knowledge** 1. Correctly examines and assesses physical and physiological signs to identify nerve agent exposure of a patient in a simulated context with a mannequin simulator or a standardized patient: • Miosis • Copious secretions • Generalized muscular	**Clinical Skills** 1. Be able to examine the patient to assess indicators of cholinergic crisis: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse	**Clinical Skills** 1. Demonstrate the ability to examine the patient and assess indicators of cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: • Eyes • Mouth • Nose • Respiratory effort • Muscle control • Pulse	**Clinical Skills** 1. Correctly examines the patient to assess indicators of cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: • Eyes

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	possible exposures. • Identify other possible medical conditions 3. Distinguish the primary combination of nerve agent exposure indicators. 4. Distinguish between the clinical indicators for vapor or liquid exposure. 5. Distinguish between the clinical indicators for the extent of poisoning	with a mannequin simulator or a standardized patient. • Identify other possible exposures. • Identify other possible medical conditions 3. Identify primary combination of nerve agent exposure indicators in a simulated context with a mannequin simulator or a standardized patient. 4. Distinguish between the clinical indicators for vapor or liquid exposure in a simulated context with a mannequin simulator or a standardized patient. 5. Distinguish between the clinical indicators for the extent of poisoning in a simulated context with a mannequin simulator or a standardized patient.	fasciculations • Respiratory distress • Cyanosis • Convulsions • Pain • GI/Urinary distress • Difficulty breathing • Fatigue • Muscle control 2. Correctly performs Differential Diagnosis (DDx) for a patient in a simulated context with a mannequin simulator or a standardized patient. • Nerve agent • Vesicant • Pulmonary Agents • Riot • Cyanide • Respiratory Irritant • Upper respiratory infections • Viral infection (GI) • Medication toxicities - opiates 3. Correctly identify primary combination of nerve agent exposure indicators in a simulated context with a mannequin simulator or a standardized patient:			• Mouth • Nose • Respiratory effort • Muscle control • Pulse

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			• Miosis • Copious secretions • Generalized muscular fasciculations • Respiratory distress • Cyanosis • Convulsions 4. Correctly determines vapor or liquid exposure in a simulated context with a mannequin simulator or a standardized patient: ***Vapor*** – Symptomatic onset within seconds to minutes; Eye, Respiratory, Secretory, Neuromuscular, Gastrointestinal ***Liquid*** – Symptomatic onset within 10 minutes to 18 hours; Muscle twitching and sweating at site of exposure, Nausea/Vomiting, Weakness, Respiratory, Gastrointestinal, Neurological		

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			Both – Convulsions, Apnea 4. Correctly determines the extent of poisoning in a simulated context with a mannequin simulator or a standardized patient. • ***Mild*** – Miosis, Headache, Rhinorrhea, Salivation, Dyspnea, Bronchoconstriction • ***Severe*** – Symptoms progress to more than one organ system. Respiratory Cessation, Neuromuscular Symptoms			
Practical	**Medication Knowledge** 1. Know the drugs, dosages, administration routes and time sequences for the management of cholinergic crisis. 2. Understand the purpose of each drug used in the management of cholinergic crisis and their respective	**Medication Knowledge** 1. Select the drugs, dosages, administration routes and time sequences for the management of cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient. 2. Evaluate the	**Medication Knowledge** 1. Correctly selects the drugs, dosages, administration routes and time sequences for the management of cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: Pre-treatment • Pyridostigmine	**Medication Skills** 1. Be able to use the following: • Mark1 Kit Auto Injector • ATNNA Auto Injector • CANA Auto Injector 2. Be able to place an IV catheter. 3. Be able to administer drugs	**Medication Skills** 1. Demonstrate the ability to use the following in a simulated context: • Mark1 Kit Auto Injector • ATNNA Auto Injector • CANA Auto Injector 2. Be able to place an IV catheter in a simulated context.	**Medication Skills** 1. Correctly uses each of the following in a simulated context: • Mark1 Kit Auto Injector • ATNNA Auto Injector

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	expected clinical effects.	clinical effects of the drugs in a simulated context with a mannequin simulator or a standardized patient.	Bromide (30mg tablet orally q 8 hours) (pre-treatment) Treatment • Mark1 Kit Auto Injector (Atropine, 2mg / 2PAMCL, 300mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • ATNAA Auto Injector (Atropine, 2.1mg / 2PAMCL, 600mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • CANA) Auto Injector (Diazepam,10mg) IM 1st injector if patient receives 3 ATNAA/ Mark1 Kits Auto Injectors 2nd/3rd injectors as	through IV catheter. 4. Be able to administer atropine ophthalmic ointment.	3. Be able to administer drugs through IV catheter in a simulated context. 4. Be able to administer atropine ophthalmic ointment (topical); 0.5” strip in pocket of lower eyelid of a patient mannequin simulator.	• CANA Auto Injector 2. Correctly places an IV catheter in a simulated context. 3. Correctly administers drugs through IV catheter in a simulated context. 4. Correctly administers atropine ophthalmic ointment (topical); 0.5” strip in pocket of lower eyelid of a patient mannequin simulator.

Level	Knowledge	Assessment	Standard	Skill	Assessment	Standard
			needed for seizing patient • Atropine Ophthalmic Ointment (topical); 0.5” strip in pocket of lower eyelid at Level 2 treatment location 2. Correctly evaluates the clinical effects of the drugs in a simulated context with a mannequin simulator or a standardized patient: • Pyridostigmine Bromide – Shields AChE enzyme from full effects of GD to enhance the effectiveness of treatment after GD exposure. • Atropine – Dry secretions, reduce bronchoconstriction, decrease gastrointestinal motility • 2PAMCL – Remove the nerve agent (except GD) from the enzyme acetylcholinesterase. • Diazepam – Control convulsions.			

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			• Atropine ophthalmological ointment – Relieve eye symptoms.			
	Health Metrics 1. Understand relevant health metrics for assessing the patient's physical and physiological status. 2. Understand relevant time sequence for exposure in assessing the patient's physical and physiological status during cholinergic crisis.	**Health Metrics** 1. Evaluates appropriate health metrics to assess a patient who may be experiencing cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient. 2. Evaluate the relevant time sequence for exposure in assessing the patient's physical and physiological status during cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient.	**Health Metrics** 1. Assesses the following health metrics in a simulated context with a mannequin simulator or a standardized patient: • Pupil Size • Respiratory status • Muscle control • Neurological status • Volume of secretions • Heart rate 2. Correctly evaluates the time sequences in a simulated context with a mannequin simulator or a standardized patient for: • Vapor • Liquid	**Health Metrics** N/A	**Health Metrics** N/A	**Health Metrics** N/A
	Situational Knowledge Identify exposure agent by using detection device(s) and situational cues.	**Situational Knowledge** 1. Assess exposure agent in a simulated context with a mannequin simulator or a standardized patient.	**Situational Knowledge** 1. Correctly assesses the exposure agent in a simulated context with a mannequin simulator or a standardized patient.	**Situational Skills** N/A	**Situational Skills** N/A	**Situational Skills** N/A

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
		2. Identify other situational cues for assessing exposure agent in a simulated context with a mannequin simulator or a standardized patient.	2. Correctly identifies other situational cues for assessing exposure agent in a simulated context with a mannequin simulator or a standardized patient, including: mass casualties, patient symptomology such as the onset of symptoms, localized or general reactions, initial symptoms, and time progression of symptoms.			
	Procedural Knowledge 1. Implements the patient management strategy for cholinergic crisis: • Self-protection • Antidote • Airway • Breathing • Circulation • Drugs • Decontamination 2. Implements the de-contamination protocol for managing a cholinergic crisis: • Remove contaminated	**Procedural Knowledge** 1. Implements patient management strategy for cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: Self-protection Antidote Treatment Airway Breathing Circulation Drugs Decontamination	**Procedural Knowledge** 1. Correctly implements patient management strategy for cholinergic crisis in a simulated context with a mannequin simulator or a standardized patient: Self-protection • Pre-treatment w/ Pyridostigmine Bromide • Don Mission-Oriented Protective Posture (MOPP) Level IV Antidote Treatment	**Procedural Skills** 1. Be able to don Mission-Oriented Protective Posture (MOPP) Level IV 2. Be able to administer • Mark 1 Kit • ATNAA • CANA 3. Be able to secure the patient's airway by performing: • Suction • Patient positioning • Bag-valve-mask • Intubation	**Procedural Skills** 1. Be able to don Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context 2. Be able to administer each of the following to a patient mannequin simulator • Mark 1 Kit • ATNAA • CANA 3. Be able to perform each of the following skills on a patient mannequin	**Procedural Skills** 1. Correctly dons Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context 2. Correctly administers each of the following to a patient mannequin simulator

Level	Knowledge	Assessment	Standard	Skill	Assessment	Standard
	clothing and gear • Decontaminate exposed skin		• Mark 1 Kit (atropine and pralidoxime chloride auto-injector) • ATNAA (antidote treatment nerve agent auto-injector; atropine and pralidoxime chloride auto-injector) • CANA (convulsant antidote for nerve agent; diazepam auto-injector) Airway • Suction • Position patient • Bag-valve-mask airway • Intubation Breathing • Assessment • Ventilation • RDIC Circulation • Assessment Drugs • Pyridostigmine Bromide (30mg tablet) (pre-treatment) • Mark1 Kit Auto Injector (Atropine, 2mg /	4. Be able to ventilate and implement RDIC to support the patient's breathing 5. Be able to perform each step of the decontamination protocol: • Remove contaminated clothing and gear • Decontaminate exposed skin • Apply reactive skin decontamination lotion (RSDL) • Irrigate with large amounts of water • Apply M291 SDK • Clean w/ soap & water • Apply M295 • Apply 0.5% hypochlorite solution	simulator:: • Suction • Patient positioning • Bag-valve-mask • Intubation 4. Be able to ventilate and implement RDIC using a patient mannequin simulator 5. Be able to perform each step of the decontamination protocol in a simulated context using the correct method on a patient mannequin simulator or standardized patient: • Remove and disposition contaminated clothing and gear. • Decontaminate exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Apply reactive skin decontamination	• Mark 1 Kit • ATNAA • CANA 3. Correctly performs each of the following skills on a patient mannequin simulator: • Suction • Patient positioning • Bag-valve-mask • Intubation 4. Correctly ventilates and implements RDIC using a patient mannequin simulator 5. Be able to perform each step of the decontamination protocol in a simulated context using the

Level	Knowledge	Assessment	Standard	Skill	Assessment	Standard
			2PAMCL, 300mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • ATNAA Auto Injector (Atropine, 2.1mg / 2PAMCL, 600mg) IM 1st injector 2nd injector 10-15 min after 1st injector 3rd injector in rapid succession, 1q 5min as needed, not to exceed 3 in 1 hour • CANA Auto Injector (Diazepam,10mg) IM 1st injector if patient receives 3 ATNAA/ Mark1 Kits Auto Injectors 2nd/3rd injectors as needed for seizing patient • Atropine Ophthalmic Ointment (topical); 0.5” strip in pocket of lower eyelid at Level 2 treatment location		lotion (RSDL) • Irrigate with large amounts of water • Apply M291 SDK • Clean w/ soap & water • Apply M295 • Apply 0.5% hypochlorite solution	correct method on a patient mannequin simulator or standardized patient: • Remove and disposition contaminated clothing and gear. • Decontaminate exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Apply reactive skin decontamination lotion (RSDL) • Irrigate with large amounts of

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			Decontamination Performs decontam-ination protocol: • Removes contaminated clothing and gear • Decontaminates exposed skin in the following order: - Face - Neck area - Chest area - Abdomen - Arms and hands - Other exposed skin areas • Applies reactive skin decontamination lotion (RSDL) • Irrigates with large amounts of water • Applies M291 SDK • Soap & water • Applies M295 • Applies 0.5% hypochlorite solution			water • Apply M291 SDK • Clean w/ soap & water • Apply M295 • Apply 0.5% hypochlorite solution
	Instruments & Supplies 1. Be able to identify the location of instruments & supplies.	**Instruments & Supplies** 1. Demonstrate the ability to locate instruments & supplies in a simulated context: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope	**Instruments & Supplies** 1. Correctly demonstrates the ability to locate instruments & supplies in a simulated context: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette	**Instruments & Supplies** 1. Be able to appropriately select and implement the following medical instruments & supplies: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette	**Instruments & Supplies** 1. Demonstrates ability to appropriately select and implement the following medical instruments & supplies in a simulated context: • Resuscitation Device, Individual, Chemical (RDIC)	**Instruments & Supplies** 1. Correctly demonstrat es ability to appropriatel y select and implement the following medical instruments

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
		• Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	• Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	• Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	• Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape	& supplies in a simulated context: • Resuscitation Device, Individual, Chemical (RDIC) • Endotracheal Tube • Stylette • Laryngoscope • Suction • Bag-valve-mask • IV Catheter • IV Fluids • Tape
	Equipment 1. Discriminate between positive detection alarm indicators or color indicators for the following detection devices: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit	**Equipment** 1. Indicate what the alarm indicators or color indicators for the following detection devices signify in a simulated context: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit	**Equipment** 1. Correctly indicate what the alarm indicators or color indicators for the following detection devices signify in a simulated context: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical	**Equipment** 1. Be able to use the following detection devices: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent	**Equipment** 1. Correctly uses the following detection devices in a classroom, lab, or field exercise: • M256A1 Chemical Agent Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent	**Equipment** 1. Correctly uses the following detection devices in a classroom, lab, or field exercise: • M256A1 Chemical Agent

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
	• ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Know to select and don Mission-Oriented Protective Posture (MOPP) Level IV.	• ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Identify protection as Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context.	Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Correctly identify protection as Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context.	Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Be able to don Mission-Oriented Protective Posture (MOPP) Level IV.	Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Demonstrates ability to don Mission- Oriented Protective Posture (MOPP) Level IV in a simulated context.	Detector Kit • M18A2 Chemical Agent Detector Kit • ICAM (Improved Chemical Agent Alarm) • M8 Chemical Agent Detector Paper • M9 Chemical Agent Detector Paper • M22 (ACADA) Automatic Chemical Agents Detection Alarm • M93A1 FOX NBC RECONNAISSANCE System • M21 (RSCAAL) Remote Sensing Chemical Agent

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
						Alarm • M90 Chemical Agent Detector • M272 (in water) 2. Correctly dons Mission-Oriented Protective Posture (MOPP) Level IV in a simulated context.
Analytical	**Clinical Knowledge** 1. Identify treatment effects. 2. Identify effects of clinical mismanagement.	**Clinical Knowledge** 1. Identify treatment effects in a simulated context. 2. Identify effects of clinical mismanagement in a simulated context.	**Clinical Knowledge** 1. Identify treatment effects in a simulated context: • Decreased secretions • Improved respiration • Improved muscle control • Reduced GI symptoms Identify effects of clinical mismanagement in a simulated context: • Absent positive			

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			treatment effects			
	Procedural Knowledge 1. Identify challenges of airway management for a patient during a cholinergic crisis 2. Understands the administration of Diazepam. 3. Evaluates and provides supportive treatment to patient as needed. 4. Determines stabilization course for patient.	**Procedural Knowledge** 1. Respond to the challenges of airway management for a patient during a cholinergic crisis in a simulated context. 2. Administers Diazepam as needed for severe effects in a simulated context. 3. Evaluates and provides supportive treatment to patient as needed in a simulated context. 4. Determines stabilization course for patient in a simulated context.	**Procedural Knowledge** 1. Respond to the challenges of airway management for a patient during a cholinergic crisis in a simulated context: • Initial ventilation is difficult due to high airway resistance (50-70 cm of water). • Resistance decreases after atropine administration. • Requires frequent suctioning. • Ventilate 0.5-3 hours. 2. Correctly administers Diazepam as needed for severe effects in a simulated context. 3. Provides supportive treatment to patient in a simulated context: • Intravenous fluids • Respiratory support 4. Stabilizes patient in a simulated context:	**Procedural Skills** 1. Be able to evaluate and adjust Instruments, supplies and equipment as needed.	**Procedural Skills** 1. Demonstrate the ability to evaluate and adjust Instruments, supplies and equipment as needed in a simulated context.	**Procedural Skills** 1. Correctly demonstrate the ability to evaluate and adjust Instruments, supplies and equipment as needed in a simulated context.

Level	*Knowledge*	*Assessment*	*Standard*	*Skill*	*Assessment*	*Standard*
			• Continue atropine, pralidoxime chloride, diazepam as needed for persistent severe symptoms			
	Situational Knowledge 1. Implement field-based care protocol. 2. Assess Level 1 Care options. 3. Assess transport to Level 2 Care facilities.	**Situational Knowledge** 1. Follow field-based care protocol in a simulated context. 2. Assess Level 1 Care options in a simulated context. 3. Assess transport to Level 2 Care facilities in a simulated context.	**Situational Knowledge** 1. Correctly follows field-based care protocol in a simulated context: • Self-care • Buddy care 2. Correctly assesses Level 1 Care options in a simulated context: • Medic • Combat Lifesaver 3. Correctly assesses transport to Level 2 Care facilities in a simulated context: • Immediate • Delayed			

Appendix 5: Critical Steps and Error Sources

Pediatric and Neonatal Intubation

Critical Step: Examine patient to assess indicators of need for airway management.
Potential Sources of Error:

- Incorrect examination
- Incorrect assessment

Critical Step: Perform DDx to determine airway management strategy.
Potential Sources of Error:

- Incorrect DDx
- Incorrect airway management strategy
- Incomplete knowledge/skills to perform strategy

Critical Step: Adjust medication doses by weight and apply appropriate time sequences to gain optimal clinical effect in pediatric and neonatal patients.
Potential Sources of Error:

- Incorrect medication
- Incorrect dosage
- Incorrect time sequence
- Incorrect weight estimation
- Incorrect administration route
- Incorrect evaluation of clinical/treatment effects

Critical Step: Intubate patient.
Potential Sources of Error:

- Incorrect equipment
- Incorrect medications
- Incomplete procedural knowledge/skills
- Incorrect strategy
- Incorrect confirmation of endotracheal intubation
- Esophageal intubation
- Right main stem intubation

Critical Step: Ventilate intubated patient.
Potential Sources of Error:

- Incorrect equipment
- Incorrect pressure
- Incorrect rate
- Incorrect connection to O2 source

Critical Step: Assesses clinical stability of patient.
Potential Sources of Error:

- Incorrect examination
- Incorrect assessment
- Failure to identify effects of clinical mismanagement

Cholinergic Crisis

Critical Step: Examine patient to assess indicators of cholinergic crisis.
Potential Sources of Error:

- Incorrect examination
- Incorrect assessment
- Incorrect DDx
- Incorrect exposure level
- Incorrect exposure type

Critical Step: Don Mission-Oriented Protective Posture (MOPP) Level IV.
Potential Sources of Error:

- Incorrect treatment strategy
- Omits self-protection
- Misjudges time constraints of exposure
- Incomplete MOPP Level IV
- Incorrect equipment, supplies, resources.

Critical Step: Administers the following for treatment: Mark1 Kit Auto Injector, ATNNA Auto Injector, CANA Auto Injector.
Potential Sources of Error:

- Incorrect medication
- Incorrect dosage
- Incorrect time sequence
- Incorrect administration route
- Incorrect evaluation of clinical/treatment effects

Critical Step: Provide suction support for patient:
Potential Sources of Error:

- Incorrect equipment
- Incorrect pressure
- Incorrect rate
- Incorrect patient positioning
- Equipment failure

Critical Step: Provide breathing support for patient:
Potential Sources of Error:

- Incorrect equipment
- Incorrect strategy selection
- Incomplete procedural knowledge/skills

Critical Step: Be able to intubate patient.
Potential Sources of Error:

- Incorrect equipment
- Incorrect medications
- Incomplete procedural knowledge/skills
- Incorrect strategy
- Incorrect confirmation of endotracheal intubation

- Esophageal intubation
- Right main stem intubation

Critical Step: Ventilate and implement RDIC.
Potential Sources of Error:
- Incorrect equipment
- Incorrect pressure
- Incorrect rate
- Incorrect connection to O2 source

Critical Step: Perform each step of the decontamination protocol.
Potential Sources of Error:
- Incorrect sequence
- Incorrect disposition
- Incorrect materials (e.g. M291 SDK, M295, etc.)
- Incomplete sequence

Appendix 6: Instructional Gaps

SUMMARY RESULTS FROM PRISMA ANALYSES
Clinical Training Mechanisms, Outcomes, Curricula and Technological Alternatives.

Pediatric & Neonatal Intubation Training – Curriculum Gaps

Literature review confirms the need for definition of performance standards, assessment metrics, and formalization of training methods.

- Training Gaps
  - Imprecise assessment mechanisms
  - Absent specific and measurable performance standards
  - Absent evidence-based training methods

Pediatric & Neonatal Intubation Training – Technology Gaps

We evaluated the most advanced computer programmable infant and neonatal simulators with real time monitoring of vital signs available through commercial vendors. The following advanced technology simulators were evaluated for adequacy of training conditions identified in the task analyses for pediatric (infant) and neonatal intubation:
Gaumard: PremieHAL, Newborn HAL,
METI: BabySIM
Laerdal: SimBaby, SimNewB

Technology review confirms gaps in necessary clinical manifestations for adequate training conditions.

- Simulator Technology Gaps
  - More copious secretions including saliva (frothy, bubbles, slobber), runny nose, tears, vomit
  - Improved muscle fasciculation, twitching, seizures
  - Airway variability –Mallampati variability, Pierre Robin airway (short mandible)
  - Lung auscultation – more realistic and localized breath sounds
    - Unrealistic, can hear breath sounds from one side all over chest wall, pump noise often drown out lung sounds.
  - Changes in airway: Airway material is easily punctured at vallecula and should be modified.
  - More anterior airway
  - Fat tongue, better tongue tissue fidelity (slippery, wet)
  - More redundant airway tissues, slippery tissues, friable/bleeding,
  - Large and floppy epiglottis
  - True preemie (28-30 weeks, <3kg)
  - Nasal flaring
  - True perioral cyanosis (1cm around the mouth turning blue)

Cholinergic Crisis Training – Curriculum Gaps

Literature review confirms the need for definition of performance standards and assessment metrics.

- Training Gaps
  - Imprecise assessment mechanisms
  - Absent specific and measurable performance standards
  - Absent evidence-based training methods

Cholinergic Crisis Training – Technology Gaps

We evaluated the most advanced computer programmable adult and pediatric simulators with real time monitoring of vital signs available through commercial vendors. The following advanced technology simulators were evaluated for adequacy of training conditions identified in the task analyses for the identification and management of a cholinergic crisis:
Gaumard: PremieHAL, Newborn HAL, NOELLE, HAL
METI: BabySIM, iStan, HPS,METIMan
Laerdal: SimBaby, SimNewB, SImMan, SimMan3G, SimMom

Technology review confirms gaps in necessary clinical manifestations for adequate training conditions.

- Simulator Technology Gaps
  - More copious secretions including saliva (frothy, bubbles, slobber), sweat, runny nose, tears, vomit, urine. Frothing cannot occur simultaneously with other secretions.
  - Vocalizations – garbled, confused, slurring, nonsensical
  - Realistic progressive occurrence of rashes, erythemas, burns, other skin conditions associated with chemical, vesicant, etc. exposure.
  - Improved muscle fasciculation, twitching, seizures (no fasciculation or lower limb options)
  - Airway variability –Mallampati variability, Pierre Robin airway (short mandible)
  - Lung auscultation – more realistic and localized breath sounds
    - Unrealistic, can hear breath sounds from one side all over chest wall, pump noise often drown out lung sounds.
  - Changes in airway: Airway material is easily punctured at vallecula and should be modified.
  - For pediatric/neonatal Airways:
    - More anterior airway
    - Fat tongue, better tongue tissue fidelity (slippery, wet)
    - More redundant airway tissues, slippery tissues, friable/bleeding,
    - Large and floppy epiglottis
    - True preemie (28-30 weeks, <3kg)
    - Nasal flaring
  - True perioral cyanosis (1cm around the mouth turning blue

Appendix 8: Assessment Instruments

PEDIATRIC/NEONATAL INTUBATION
COGNITIVE ASSESSMENT

1. What methods can be used to determine endotracheal tube size? Circle all that apply. (*Count this as 5 questions – 1 for each possible answer*.)
   a. Patient's Age/4 + 4
   b. Size (diameter) of the patient's fifth finger
   c. (Patient's age + 4)/16
   d. Broselow tape
   e. (Patient's Age + 16)/4

2. How does an infant's airway differ from an adult's? Circle all that apply. (*Count this as 5 questions – 1 for each possible answer*.)
   a. An infant's tongue is proportionally smaller than an adult's.
   b. An infant's epiglottis is proportionally larger and floppier than an adult's.
   c. An infant's airway is more anterior than an adult's.
   d. An infant's head is proportionally larger than an adult's.
   e. The narrowest part of an infant's airway is supraglottic while the narrowest part of an adult's is subglottic.

3. What is an appropriate dose of succinylcholine for intubating a 7kg infant? (*2X weight*)
   1-2 mg/kg or 7-14 mg

4. What is the sedative of choice and an appropriate dose for intubating a 3-year-old child who is experiencing a severe asthma exacerbation? (Count this as 2 questions, *1.5X weight*)
   a. Ketamine, b. 1-2 mg/kg – we didn't give them a weight or specify that we wanted a per kg dosing so accept any dose that would work for a 10-25kg child (or the per kg dose)

5. What medication could be used to prevent bradycardia (decreased heart rate) that may be associated with intubation in an infant? (*2X weight*)
   Atropine

6. Describe how you would position an infant for intubation. (*1 point for each*)
   Prone (on back)
   Head-tilt chin lift (neck extended, head tipped backwards)
   Towel roll under shoulders

7. Describe at least 3 methods for determining correct endotracheal tube placement. (*score 1 point for each*)
   CO2 detector
   Visualize tube pass through cords (*going in is ½ point*)
   Chest x-ray
   Fogging of tube
   Auscultation

8. What size and type laryngoscope blade would you use to intubate a newborn (3-4kg infant)? (*Count this as 2 questions*)
   a. Size 1

b. Miller (straight blade)

9. What is the dose of etomidate for intubating an infant? (*weighted 2x*)
   0.3-0.6 mg/kg

10. How do you determine appropriate depth of endotracheal tube placement? (*1 point each*)
    Broselow tape
    3 X tube size
    See double lines (or cuff) on tube go just beyond the vocal cords

PEDIATRIC INTUBATION COMPETENCY EVALUATION

Date: _____ Unique ID: _____Level: (circle) *None Novice Intermed Advanced*

Evaluator: _____ Training: *Animal*_____ *Simulator* _____

RSIs before today: Assisted_____ Performed _____

Instructions: Please mark the box that best corresponds to your assessment of the item

Item	***Rating Scale***			
PREPARATION				
❍ ET Tube w/ stylette	❍ Ambu bag w/ mask	❍ Attach Ambu bag to wall	❍ Laryngoscope	
❍ 10cc syringe	❍ Suction	❍ Establish IV Access	❍ Meds	
PREOXYGENATION				
Mask Selection/Application	Correct Selection	Incorrect Selection	Correct Application	Incorrect Application
Bag to Maintain O2 Sat	< 90	90 - 93	94 - 96	≥ 97
SEDATION				
Appropriate Med/Dose	Correct Med: Etomidate___ Versed_____ Ketamine___	Incorrect Med	Correct Dose: Etomidate (1.8-4.2 mg) Versed (0.3-0.7 mg) Ketamine (6-14 mg)	Incorrect Dose
PARALYSIS				
Appropriate Med/Dose	Correct Med: Succinocholine___ Vecuronium_____ Rocuronium_____	Incorrect Med	Correct Dose: Succinocholine (6-14 mg) Vecuronium (1.2-1.4 mg) Rocuronium (6-14 mg)	Incorrect Dose
INTUBATION				
Time for placement from 1st approach	> 2 min	≤ 2 min	≤ 1 min	≤ 30 sec
CONFIRMATION				
Method Selected	None	CO2 Monitor	Chest Xray	Listen to lungs + ABD
ESOPHAGEAL INTUBATION **N/A**				
Recognition Time	> 60 sec	≤ 31 – 60 sec	≤ 11 - 30 sec	≤ 10 sec
Identify Treatment: Remove/Start Over	> 60 sec	≤ 31 - 60 sec	≤ 16 - 30 sec	≤ 15 sec
RT MAIN STEM INTUBATION **N/A**				
Recognition Time	> 60 sec	≤ 31 - 60 sec	≤ 11 - 30 sec	≤ 10 sec
Identify Treatment: Pull Back Tube	> 60 sec	≤ 31 - 60 sec	≤ 16 - 30 sec	≤ 15 sec

Comments:

NEONATAL INTUBATION COMPETENCY EVALUATION

Date: _____ Unique ID: _____ Level: (circle) *None* *Novice* *Intermed* *Advanced*

Evaluator: _____ Training: *Animal*_____ *Simulator* _____

RSIs before today: Assisted_____ Performed _____

Instructions: Please mark the box that best corresponds to your assessment of the item

Item	***Rating Scale***			
PREPARATION				
❍ ET Tube w/ stylette	❍ Ambu bag w/ mask	❍ Attach Ambu bag to wall	❍ Laryngoscope	
❍ 10cc syringe	❍ Suction	❍ Establish IV Access	❍ Meds	
PREOXYGENATION				
Mask Selection/Application	Correct Selection	Incorrect Selection	Correct Application	Incorrect Application
Bag to Maintain O2 Sat	< 90	90 - 93	94 - 96	≥ 97
SEDATION				
Appropriate Med/Dose	Correct Med: Etomidate___ Versed_____ Ketamine___	Incorrect Med	Correct Dose: Etomidate (0.9-3.0 mg) Versed (0.15-0.5 mg) Ketamine (3-10 mg)	Incorrect Dose
PARALYSIS				
Appropriate Med/Dose	Correct Med: Succinocholine___ Vecuronium_____ Rocuronium_____	Incorrect Med	Correct Dose: Succinocholine (3-10 mg) Vecuronium (0.6-1.0 mg) Rocuronium (3-5 mg)	Incorrect Dose
INTUBATION				
Time for placement from 1st approach	> 2 min	≤ 2 min	≤ 1 min	≤ 30 sec
CONFIRMATION				
Method Selected	None	CO2 Monitor	Chest Xray	Listen to lungs + ABD
ESOPHAGEAL INTUBATION **N/A**				
Recognition Time	> 60 sec	≤ 31 – 60 sec	≤ 11 - 30 sec	≤ 10 sec
Identify Treatment: Remove/Start Over	> 60 sec	≤ 31 - 60 sec	≤ 16 - 30 sec	≤ 15 sec
RT MAIN STEM INTUBATION **N/A**				
Recognition Time	> 60 sec	≤ 31 - 60 sec	≤ 11 - 30 sec	≤ 10 sec
Identify Treatment: Pull Back Tube	> 60 sec	≤ 31 - 60 sec	≤ 16 - 30 sec	≤ 15 sec
Comments:				

SELF-EVALUATION QUESTIONNAIRE

Name_____Date_____

Please use the scale associated with each item to indicate the degree to which you agree or disagree with the item. For example, if you strongly agree with the item, mark the scale corresponding to column for "strongly agree." When you have completed the survey, please give it to one of the researchers before leaving the assessment area.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I am familiar with the equipment used for pediatric/neonatal intubation						
I am able to correctly use the tools associated with performing pediatric/neonatal intubation						
I know the procedural steps required to perform pediatric/neonatal intubation						
I am able to correctly identify the principal anatomy associated with intubation						
I am able to accurately identify the need for pediatric/neonatal intubation						
I am able to successfully perform pediatric/neonatal intubation						
I feel calm						
I feel secure						
I am tense						
I feel at ease						
I feel upset						
I am presently worrying over possible mistakes						
I feel rested						
I feel anxious						
I feel comfortable						
I feel self-confident						
I feel nervous						
I am jittery						
I feel "high strung"						
I am relaxed						
I feel content						
I am worried						
I feel over-excited and "rattled"						
I feel joyful						
I feel pleasant						

PERFORMANCE ASSESSMENT

NOTE: *The format for this assessment instrument will be finalized after validation data are collected. The assessment items are listed below, along with any specific performance parameter to be assessed.*

			No	***Partial***	***Yes***
1.0	***Correctly dons Mission- Oriented Protective Posture (MOPP) Level IV.***				
2.0	***Correctly assesses patient for signs of nerve agent exposure (verbalizes & examines).***				
	2.1	Miosis			
	2.2	Copious secretions			
	2.3	Generalized muscular fasciculations			
	2.4	Difficulty breathing			
	2.5	Cyanosis			
	2.6	Convulsions			
	2.7	Pain			
	2.8	GI/Urinary distress			
	2.9	Respiratory distress			
	2.10	Fatigue			
	2.11	Muscle control			
3.0	***Correctly performs Differential Diagnosis (DDx).***				
	3.1	***Identifies alternate diagnoses (verbalizes 3 alternates).*** Correct responses: Vesicant, Pulmonary Agents, Riot Gas, Cyanide, Respiratory Irritant, Upper respiratory infections, Viral infection (GI), Medication toxicities (Opiates).			
	3.2	***Identifies distinguishing symptoms for nerve agent exposure (verbalizes).*** Correct responses: Copious secretions, Generalized muscular fasciculations, Respiratory distress, Cyanosis, Convulsions.			
4.0	***Correctly uses the M9 Chemical Agent Detector Paper.***				
5.0	***Correctly identifies other situational cues for assessing exposure agent (verbalizes at least 3).*** Correct responses: mass casualties, onset of symptoms, localized or general reactions, initial symptoms, time progression of symptoms, M9 indicator.				
6.0	***Correctly determines vapor exposure.***				
7.0	***Correctly determines moderate poisoning***				
8.0	***Correctly locates instruments & supplies in supply kit.***				
9.0	***Correctly implements ATNAA Auto Injector, dosages, administration routes, time sequences.***				
	9.1	1 injector/dose			
	9.2	IM injection			
	9.3	0 min, +10-15min, +15-20 min, +20-25min, +25-30min			
10.0	***Correctly evaluates the clinical effects of ATNAA Auto Injector (verbalizes at least 2).*** Correct responses: Remove the nerve agent, dry secretions, reduce bronchoconstriction, decrease gastrointestinal motility.				

11.0	***Correctly demonstrates ability to appropriately implement the following interventions:***				
	11.1	Suction			
	11.2	Bag-valve-mask			
	11.3	IV Catheter			
	11.4	Resuscitation Device, Individual, Chemical (RDIC)			
	11.5	Endotracheal Intubation			
12.0	***Correctly implements CANA Auto Injector, dosages, administration routes, time sequences.***				
	12.1	1 injector/dose			
	12.2	IM injection			
	12.3	After 3rd ATNAA injection, +5min, +10min			
13.0	***Correctly evaluates the clinical effects of Diazepam (verbalizes).*** Correct response: Control convulsions.				
14.0	**Evaluates treatment effects during patient management:**				
	14.1	Decreased secretions.			
	14.2	Improved respiration.			
	14.3	Improved muscle control.			
	14.4	Reduced GI symptoms.			
15.0	***Correctly provides supportive treatment to stabilize patient.***				
	15.1	*Correctly continues drug therapy as needed.*			
	15.2	*Correctly provides respiratory support as needed.*			
	15.3	*Correctly provides Intravenous fluids as needed.*			
16.0	***Correctly identifies next steps (verbalizes).*** Correct responses: Decontamination, Transport to Level 2 care facility.				

COGNITIVE TEST

ID Number: Date: Group:

Cholinergic Crisis Recognition and Response
Written Assessment (ANSWERS ARE BOLD)

1. Match names to the functions of the systems listed below (1 point each). For example, Urinary: C

Organ System	Match Letter	Function
Urinary:	C	A. Exchanges oxygen and carbon dioxide as a means of oxygenating blood.
Gastrointestinal:	**B**	B. Converts food into energy the body requires to survive and eliminates residue waste.
Respiratory:	**A**	C. Eliminates toxins and fluid waste excreted by the kidneys.
Cardiovascular:	**H**	D. Facilitates visual perception.
Neurological:	**G**	E. Supports the weight of the body, maintains body position and produces controlled, precise movements.
Endocrine:	**F**	F. Secretes different types of hormones that regulate bodily functions.
Ophthalmological:	**D**	G. Transmits signals between different parts of the body to coordinate voluntary and involuntary actions.
Musculoskeletal:	**E**	H. Transports blood bourn elements throughout the body, eliminates metabolic wastes, circulates lymph to counter microbes and toxins, and maintains homeostasis.

2. Explain the normal function of the enzyme acetylcholinesterase in controlling the neuron signal processing of the nervous system:
A. Breaks down acetylcholine after transmission
B. Acts as the receptor for transmitted acetylcholine
C. Terminates the transfer of acetylcholine
D. Initiates signal transmission via acetylcholine

3. Explain how nerve agents interfere with AChE leading to cholinergic crisis:
A. Inhibits acetylcholinesterase production
B. Inhibits acetylcholinesterase function
C. Inhibits acetylcholine production
D. Inhibits acetylcholine transmission

4. Describe the primary signs to look for during patient assessment to identify nerve agent exposure:
A. Pain, GI/Urinary distress, Respiratory distress, Erythema, Muscular fasciculations, Convulsions
B. Fever, Respiratory distress, Tachycardia, Convulsions, Diaphoresis, Peripheral Numbness
C. Fever, Pain, GI distress, Respiratory distress, Rhinorrhea, Lacrimation, Diaphoresis
D. Copious secretions, Muscular fasciculations, Respiratory distress, Miosis, Convulsions

5. Indicate the information to request from a conscious patient during clinical assessment:
A. Pain, GI/Urinary distress, Difficulty breathing, Sight changes, Muscle control
B. Pain, GI/Urinary distress, Difficulty breathing, Fatigue, Muscle control
C. Pain, GI/Urinary distress, Difficulty breathing, Sight changes, Peripheral Numbness
D. Pain, GI/Urinary distress, Difficulty breathing, Muscle control, Peripheral Numbness

6. Indicate the correct dosages, administration routes and time sequences (up to three doses in 1-hour) for ATNAA autoinjector treatment of cholinergic crisis in an adult:
A. One ATNAA autoinjector, IM, dose1 @ 5-10 minutes, dose 2@10-15 minutes, dose 3@15-20 minutes.
B. One ATNAA autoinjector, IM, dose1 @ 5-10 minutes, dose 2@15-20 minutes, dose 3@25-30 minutes.
C. One ATNAA autoinjector, IM, dose1 @ 0 minutes, dose 2@15-20 minutes, dose 3@25-30 minutes.
D. One ATNAA autoinjector, IM, dose1 @ 0 minutes, dose 2@10-15 minutes, dose 3@15-20 minutes.

7. From the list below, select three other possible medical conditions that lead to similar patient symptomology as a cholinergic crisis.
Response options:

Vesicant Exposure Radiation Exposure Anaphylaxis
Congestive Heart Failure Viral Meningitis **Riot Gas Exposure**
Upper Respiratory Infection Asthma **Medication Toxicity (Opiates)**

1.
2.
3.
4.

8. Match the expected clinical effects to the drugs used in the management of cholinergic crisis:

Drug	Match Letter	Function
2PAMCL:	**B**	A. Control convulsions.
Atropine:	**C**	B. Remove the nerve agent from the enzyme acetylcholinesterase.
Diazepam:	**A**	C. Dry secretions, reduce bronchoconstriction, decrease gastrointestinal motility.
Pyridostigmine Bromide:	**E**	D. Relieve eye symptoms.
Atropine Ophthamological Ointment:	**D**	E. Shields AChE enzyme from full effects of GD nerve agent to enhance the effectiveness of treatment after GD exposure.

9. The ATNAA autoinjector includes which of the following:
A. Atropine, 2mg / 2PAMCL, 600mg
B. Atropine, 2mg / 2PAMCL, 300mg
C. Atropine, 2.1mg / 2PAMCL, 600mg
D. Atropine, 2.1mg / 2PAMCL, 300mg

10. Indicate the time sequences for vapor exposure to nerve agents:
A. onset within seconds to minutes
B. onset within minutes to hours
C. onset within minutes to days
D. onset within hours to days

11. Indicate the time sequences for liquid exposure to nerve agents:
A. onset within seconds to minutes
B. onset within minutes to hours
C. onset within minutes to days
D. onset within hours to days

11. A positive indicator for M9 Chemical Agent Detector Paper is:
A. Orange
B. Blue
C. Green
D. Yellow

12. Identify other situational cues used for assessing nerve agent exposure including:
A. Multiple casualties
B. Burn injuries
C. Odor
D. All of the above

13. Indicate the correct transfer of care sequence by placing a "1" for the first, "2" for the second, etc.:
Level 1 Care_____ (**Answer: 3)** Buddy care _____ **(Answer: 2)** Self-care_____ **(Answer: 1)**
Level 2 Care_____ **(Answer: 4)**

15. If patient is symptomatic, describe the treatment sequence for managing cholinergic crisis:
A. Self-protection, Mark1Kit Injection, Airway Management, Respiratory Support, CANA injection
B. Self-protection, Airway Management, Mark1Kit Injection, Respiratory Support, CANA injection
C. Self-protection, Airway Management, Respiratory Support, Mark1Kit Injection, CANA injection
D. Self-protection, Mark1Kit Injection, CANA injection, Airway Management, Respiratory Support

16. Which of the following is NOT part of the decontamination protocol for cholinergic crisis patient management:
A. Remove contaminated clothing and gear
B. Decontaminate exposed skin
C. Apply reactive skin decontamination lotion (RSDL)
D. Irrigate with large amounts of water
E. Apply M291 SDK
F. Clean w/ soap & water
G. Apply M295
H. Apply 0.5% hypochlorite solution
I. Incinerate contaminated clothing and gear

17. What Mission-Oriented Protective Posture (MOPP) level of protection is required for responding to a cholinergic event?
A. Level III
B. Level IV
C. Level V
D. Level VI

18. Match the likely cause (exposure) to the listed symptomology:
A. Vesicant
B. Pulmonary Agent
C. Cyanide
D. Riot Gas
E. Respiratory Irritant
F. Upper Respiratory Infection
G. Viral Infection (GI)
H. Medication Toxicity (Opiates)

20.1: Respiratory discomfort (coughing, wheezing, shortness of breath, chest tightness), irritation to eyes, nose, upper airway. Likely Cause/Exposure(s):_____ **(Answer: E)**

20.2: Pulmonary edema (secretions, cough difficulty breathing), seizures, respiratory arrest, cardiac arrest. Likely Cause/Exposure(s): _____ **(Answer: C)**

20.3: Cough, erythema, blisters, conjunctivitis. Likely Cause/Exposure(s):_____**(Answer: A)**

20.4: Respiratory discomfort (coughing, difficulty breathing, shortness of breath), burning pain on mucous membranes, skin and eyes. Likely Cause/Exposure(s):_____ **(Answer: D)**

20.5: Airway irritation, shortness of breath (delayed onset), eye irritation, chest tightness. Likely Cause/Exposure(s):_____ **(Answer: B)**

21. Given the following information, is the nerve agent exposure vapor or liquid?
Symptomatic onset within 10 minutes to 18 hours; Muscle twitching and sweating at site of exposure, Nausea/Vomiting, Weakness, Respiratory, Gastrointestinal, Neurological.
Vapor: _____ **Liquid:** _____

22. Given the following information, is the nerve agent exposure mild or severe?
Miosis, Headache, Rhinorrhea, Salivation, Dyspnea, Bronchoconstriction.
Mild: _____ Severe: _____

23. Indicate the ATNAA autoinjector time sequence for management of cholinergic crisis in an adult:
a. 1st dose after 5 minutes; 2nd – 6th doses at 5-minute intervals thereafter.
b. 1st dose after 5 minutes; 2nd dose 5 minutes after 1st dose, 3rd – 6th dose at 10-minute intervals after 2nd dose.
c. 1st dose immediately; 2nd dose 10 minutes after 1st dose, 3rd – 6th dose at 5-minute intervals after 2nd dose.
d. 1st dose immediately; 2nd – 6th doses at 10-minute intervals thereafter.

SELF-EVALUATION QUESTIONNAIRE

Name_____Date_____
Please use the scale associated with each item to indicate the degree to which you agree or disagree with the item. For example, if you strongly agree with the item, mark the scale corresponding to column for "strongly agree." When you have completed the survey, please give it to one of the researchers before leaving the assessment area.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I am familiar with the equipment used for cholinergic crisis management.						
I am able to correctly use the tools associated with cholinergic crisis management.						
I know the procedural steps required for cholinergic crisis management.						
I am able to correctly identify the principal anatomical and physiological reactions associated with cholinergic crisis management.						
I am able to accurately identify the need for cholinergic crisis management.						
I am able to successfully perform the procedures associated with cholinergic crisis management.						
I believe the antidote for nerve agent exposure is effective in resolving cholinergic crisis.						
I feel calm						
I feel secure						
I am tense						
I feel at ease						
I feel upset						
I am presently worrying over possible mistakes						
I feel rested						
I feel anxious						
I feel comfortable						
I feel self-confident						
I feel nervous						
I am jittery						
I feel “high strung”						
I am relaxed						
I feel content						
I am worried						
I feel over-excited and “rattled”						
I feel joyful						
I feel pleasant						

Appendix 8: Instructional Components

Pediatric Intubation

Joseph B. House, MD
Suzanne Dooley Hash, MD
Pamela Andrea; a PhD

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Objectives

- Reasons to Intubate
- Anatomy
  - Neonatal
  - Cat
- Medication
- The Procedure
  - Post-procedure confirmation

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What is intubation

- Placing a plastic tube into the airway of your patient

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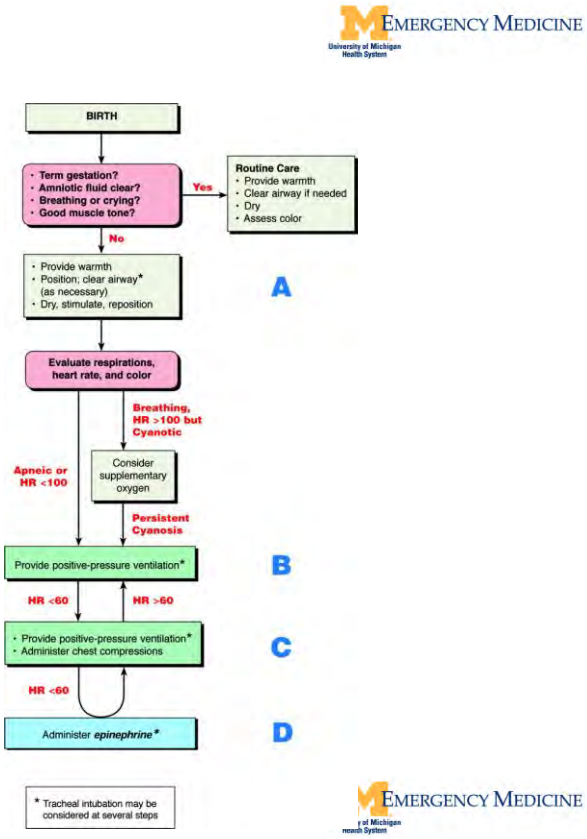
Why to intubate

- Failure to VenDlate (remove carbon dioxide)
  - Neuromuscular weakness
  - ObstrucDve pulmonary disease
- Failure to Oxygenate
  - Pulmonary disease
- Failure to protect airway
  - Altered mental status – neurologic, toxic
- Failure to maintain patent airway
  - ObstrucDon, secreDons, injury, blood
- Significant hemodynamic instability
- OperaDve needs



Signs of Distress

- RetracDons'
- Nasal'Flaring'
- Apnea'
- Cyanosis'

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Signs of Distress

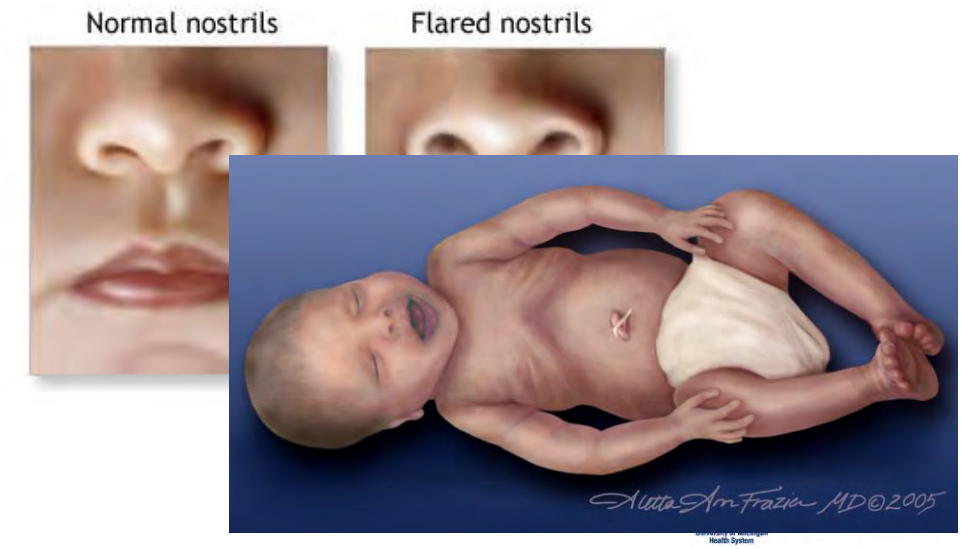

Figure 27: Adult Airway
Anatomy of adult airway

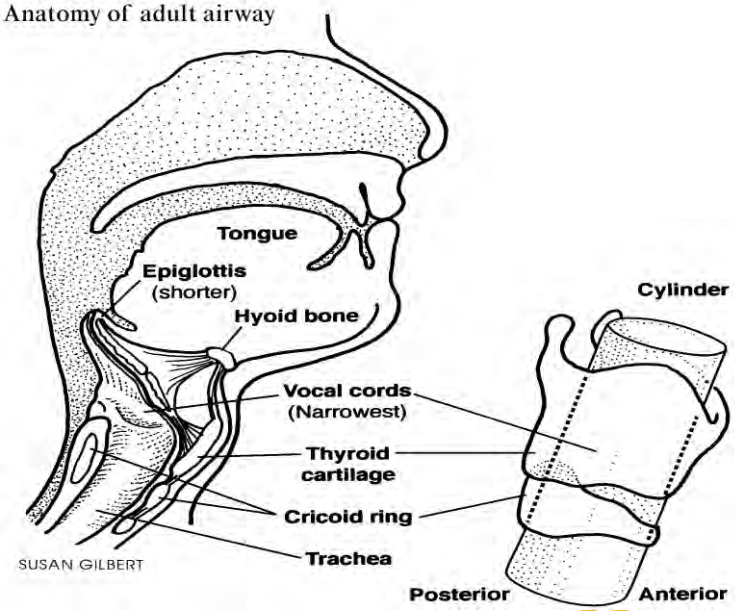

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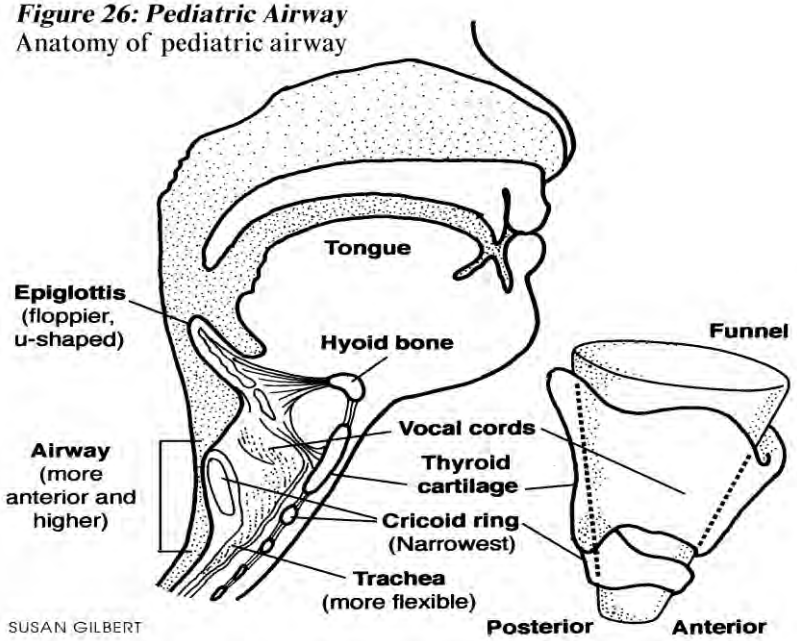
Figure 26: Pediatric Airway
Anatomy of pediatric airway



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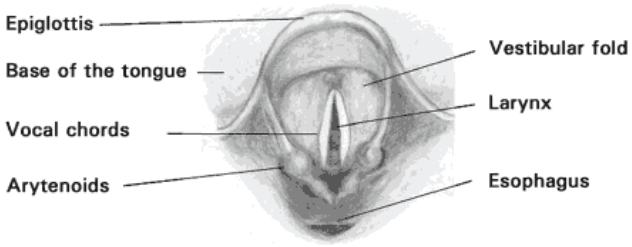

Figure 1 - View of the glottic area via direct laryngoscopy

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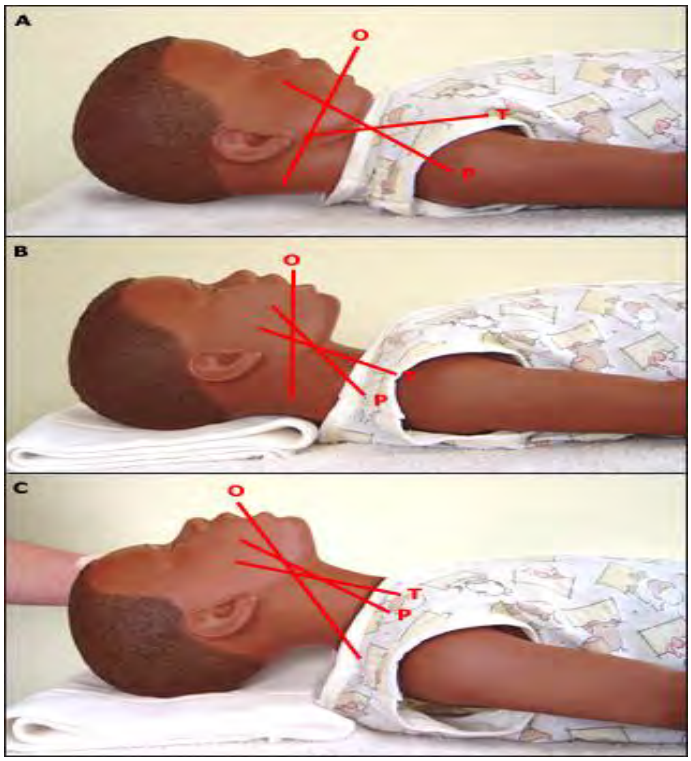

Normal position with obstruction

Sniffing position with towel under helps with support of airway

Mild extension further opens/aligns airway." Overextension will hinder

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Endotracheal Intubation

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Endotracheal Size

- Determining Size
  - (16 + age) / 4
  - (age/4) + 4
  - Broselow tape
    - Tape measure utilizing median weight for length
  - Size of pinky finger after 1y/0

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How deep to insert tube

- Use Broslow Tape
- 3 x tube size
- On end of ETT lines, insert to just past cords, if using e; with balloon, balloon just past cords

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Laryngoscope Blades

- Size:'
- Broselow'tape'
- Measure'from'tragus'to'cricoid' membrane'
- Be; er'too'long'vs'too'short'

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Other needed equipment

- Stylet':''maintains'firmness'of'ET'Tube'
- pCO2'detector: "
  - Litmus'paper:'"yellow'is'a'go
- Tape'
- SucDon'
- Bag/mask'

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Masks

- Should fit from base of chin to mid-bridge of nose
- Cushion helps make be; er seal
- Use best fit
- Will need to adjust based on size

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Correct positioning

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Bag-mask Ventilation

- Use C-E hand configuration
- Can use jaw thrust
- Should have a firm
- seal
- Do not block anterior neck

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Medication

- Sedative
  - Etomidate (0.3 -0.6 mg/kg)
  - Versed (0.05-0.1 mg/kg)
  - Ketamine (1-2mg/kg) [may choose for patient with asthma]
- Paralytic
  - Succinylcholine (1-2mg/kg)
- Atropine: (0.2 mg/kg) [prevent bradycardia]
- Use Broselow Tape

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How to Intubate

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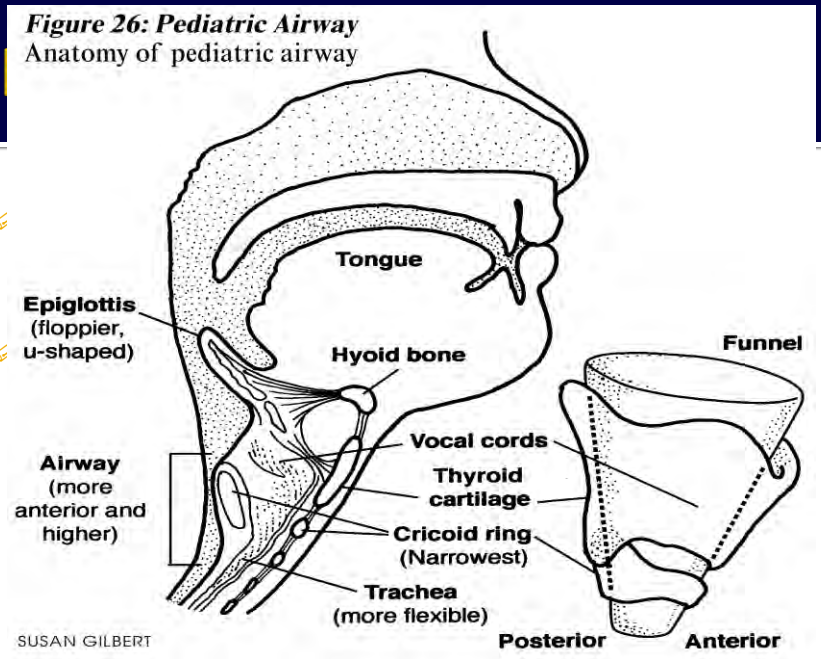

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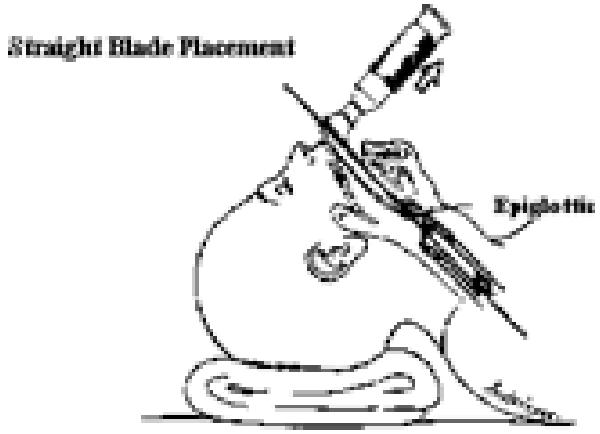

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Confirmation

- Verbalize "see tube pass through cords"
- Auscultation of breath sounds
- CO_2 detector
- Post intubation chest x-ray

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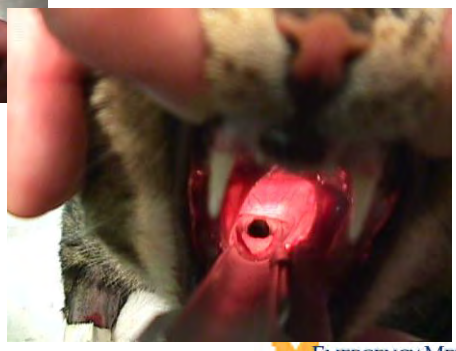

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CAT1

Epiglottis

Can just barely See the dorsal arytenoids

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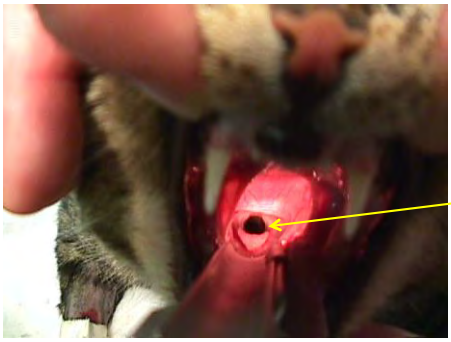
CAT2



Much better Epiglottis easily seen, the arytenoid cartilages are abducted (have been given local anesthetic to stop laryngospasm

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Endotracheal Intubation Of The Cat –(in dorsal recumbency)

- Cat will have previously received injection of sedative combined with pain medication and have an intravenous catheter in place
- Cat will be induced with anesthetic drug
- Lidocaine will be dripped on arytenoid cartilage (1-2 drops per side)
- Cat will be placed in dorsal recumbency (on their back)
- Endotracheal tube (size 3.0-4.5mm) and laryngoscope with size 0-1 Miller blade will be made ready
  ** NOTE- laryngoscope light must not be turned on prior to use to avoid burning mucosal tissue with hot bulb
- Laryngoscope is held upside down with non-dominant hand (shape of L) and endotracheal tube is held in dominant hand
- Tip of laryngoscope blade is advanced into mouth and placed rostral to epiglottis
- To help open arytenoids, upward pressure is applied to tongue base (lift handle of scope slightly toward ceiling and rotate wrist to bring top end of scope handle towards your body)
- It is extremely important to avoid touching the epiglottis or arytenoid cartilages since the cat larynx is very prone to spasm
- Once the arytenoid cartilages are visualized on both sides of larynx the endotracheal tube is positioned, in the mouth alongside the laryngoscope, **ready** to be placed
- If the arytenoid cartilages are closed, **DO NOT** attempt to push through them or bump up against them. The cartilages must be open before you attempt to pass the tube.
- Wait for the arytenoids to open and quickly (**but gently**) advance through the space in between. Sometimes many seconds will pass before the cat takes another breath.
- If spasms are occurring, additional drops of lidocaine can be applied (1 drop each side)
- Once the endotracheal tube has passed between the arytenoids, remove the laryngoscope (ensure endotracheal tube is not coughed out or pulled out while removing scope).
- Endotracheal tube is gently advanced further into the trachea so the inflatable cuff is positioned caudal to the larynx but rostral to the thoracic inlet.

CHOLINERGIC CRISIS CLINICAL MANAGEMENT INSTRUCTION

Training Sequence

- Didactic Instruction
- Introduction to laboratory facilities
- Practice procedural tasks – simulated context (SimMan3G)
- Multimedia application – simulated context (animal video or physiological animation)
- Cognitive assessment and feedback
- Clinical preparation
- Self-preparation
- Clinical assessment of patient – simulated context
- Patient preparation – simulated context
- Master procedural tasks – simulated context
    - Clinical practice
    - Performance assessment
    - Feedback
    - Repeat 9a-9c until standards of performance are achieved.

Course Content & Materials.

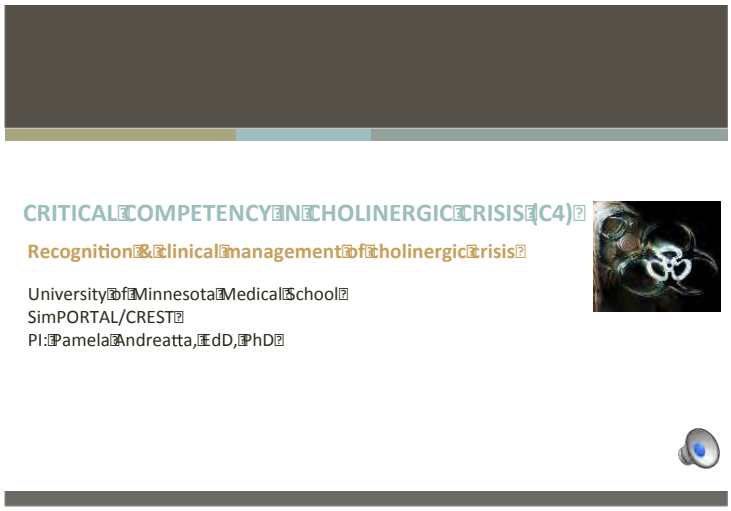
Course materials were completed in 2013-Q3.

Didactic Presentation

Presentation materials from USAMRICD courses titled *Medical Management of Chemical and Biological Casualties* and *Field Management of Chemical and Biological Casualties* will be used for the following content areas:

- Introduction to Chemical Agents
- Nerve Agents
- Anatomy
- Physiology

Lecture and discussions will take place over 20-minutes.



IDENTIFY SIGNS OF POTENTIAL NERVE AGENT EXPOSURE

- **LIQUID/GAS AGENTS: TABUN (GA); GB (SARIN); GD (SOMAN); GF; VX)**
- Identify situational cues for exposure to a chemical agent:
  - Mass casualties
  - Chemical residue
  - Odor (not all agents)
  - Initial patient symptoms
  - Onset of patient symptoms
  - Localized or general patient reactions
  - Time progression of symptoms.

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  - Initial patient symptoms
  - Onset of patient symptoms
  - Localized or general patient reactions
  - Time progression of symptoms.

TRANSFER OF CARE

1. Self-Care
2. Buddy Care
3. Level 1 Care (Medic, Combat Lifesaver)
4. Medical transport to appropriate Level 2+ receiving facility if possible
5. Field stabilization and monitoring if transport not available

PHYSICAL SIGNS & SYMPTOMS OF CHOLINERGIC CRISIS

Eye Symptoms
- Miosis
- Vision changes (blurred, dim)
- Eye pain
- Dull ache in frontal part of head
- Conjunctival injection

Gastrointestinal Symptoms
- Nausea
- Vomiting
- Abdominal Pain / Heartburn
- Diarrhea
- Involuntary Defection/Urination

Respiratory Symptoms
- Respiratory distress – mild to severe
- Increased Secretions
- Dyspnea
- Chest tightness
- Bronchospasm
- Bronchoconstriction
- Apnea / Respiratory cessation

PHYSICAL SIGNS & SYMPTOMS OF CHOLINERGIC CRISIS

Neuro-muscular Symptoms
- Feeling of weakness
- Flaccid Paralysis
- Muscle fasciculations / twitching
- Seizures
- Convulsions
- Loss of Consciousness
- Mental status changes

Secretory Symptoms
- Sweating – local or generalized
- Salivation – copious
- Rhinorrhea – copious
- Lacrimation – copious
- Bronchial – copious

Cardiovascular Symptoms
- Low, High or Normal Heart Rate
- Change in Heart Rate
- Bradyarrhythmias first (1st, 2nd, 3rd degree heart block)

PERFORM DIFFERENTIAL DIAGNOSIS (DDX)

Identify primary combination of nerve agent exposure indicators
- Miosis
- Copious secretions
- Generalized muscular fasciculations
- Respiratory distress
- Cyanosis
- Convulsions

Identify other possible medical conditions
- Upper respiratory infections
- Viral infection (GI)
- Medication toxicities – opiates

PERFORM DIFFERENTIAL DIAGNOSIS (DDX)

Identify other possible exposures

- *Vesicants*
  - Cough, erythema, blisters, conjunctivitis
- *Pulmonary Agents*
  - Airway irritation, shortness of breath (delayed onset), eye irritation, chest tightness
- *Cyanide*
  - Pulmonary edema (secretions, cough difficulty breathing), seizures, respiratory arrest, cardiac arrest
- *Riot Agent*
  - Respiratory discomfort (coughing, difficulty breathing, shortness of breath), burning pain on mucous membranes, skin and eyes
- *Respiratory Irritants*
  - Respiratory discomfort (coughing, wheezing, shortness of breath, chest tightness), irritation to eyes, nose, upper airway.

IDENTIFY EXPOSURE AGENT

Use available detection options

- **M9 Chemical Agent Detector Paper**
  - Yellow-Brown for vapor; Pink, red, reddish brown, purple for liquid nerve agents or vesicants
  - Discriminate between positive detection indicators

Determine Vapor or Liquid Exposure

- **Vapor** – Symptomatic onset within seconds to minutes;
  - Eye, Respiratory, Secretory, Neuromuscular, Gastrointestinal
- **Liquid** – Symptomatic onset within 10 minutes to 18 hours
  - Muscle twitching and sweating at site of exposure, Nausea/Vomiting, Weakness, Respiratory, Gastrointestinal, Neurological
- **Both** – Convulsions, Apnea

Determine Extent of Poisoning

- **Mild** – Miosis, Headache, Rhinorrhea, Salivation, Dyspnea, Bronchoconstriction
- **Severe** – Symptoms progress to more than one organ system. Respiratory Cessation, Neuromuscular Symptoms

MANAGEMENT STRATEGY

Self Protection

- Pretreatment with ***Pyridostigmine Bromide:*** 1 one 30mg tablet orally q 8 hours (pre-treatment). Shields AChE enzyme from full effects of GD to enhance the effectiveness of treatment after GD exposure.
- Don Mission-Oriented Protective Posture (MOPP) Level IV
- Protective mask
- Chemical protective over-garment
- Gloves
- Protective footwear/over-boots

Patient Management

Secure Patient

- Move patient as needed to safety

MANAGEMENT STRATEGY 2

Identify Location of Medical Supplies

- Suction
- Bag-valve/laryngeal mask
- Resuscitation Device, Individual, Chemical (RDIC)
- Endotracheal Tube/Stylette
- Laryngoscope
- Needles
- IV Catheter
- IV Fluids
- Tape
- Scalpels

MANAGEMENT STRATEGY 3

Perform Medical Management (ABCD Treatment)

1. **Airway** – Suction; Position patient; Secure airway; Resuscitation Device, Individual, Chemical (RDIC); Intubation if needed. Requires frequent suctioning.
2. **Breathing** – Assessment; drugs; bag-valve-mask ventilation. Initial ventilation is difficult due to high airway resistance (50-70 cm of water). Resistance decreases after atropine administration. Ventilate 0.5-3 hours.
3. **Circulation** – Assessment, drugs.

MANAGEMENT STRATEGY 4

Perform Medical Management (ABCD Treatment) - Continued

4. **Administer Drugs** – Antidote, Symptom Management

Atropine: Dry Secretions, reduce bronchoconstriction, decrease gastrointestinal motility. 2mg/dose (>12 years); 1mg/dose (6-12 years); 0.5mg/dose (age 1-5 years); 0.25mg/dose (<1 years).

ATNAA/ Atropine Auto Injector

- 1st injector (2.1mg) IM
- 2nd injector (2.1mg) IM 10-15 min after 1st injector
- 3rd injector (2.1mg) IM in rapid succession, 1 q 5 min as needed

Praladoxime Chloride (2PAM Cl): Remove the nerve agent (except GD) from the enzyme acetylcholinesterase. (25/50mg/kg; 2000mg max for all).

ATNAA Auto Injector: 3 injectors (>12 years); 2 injectors (6-12 years); 1 injector (age 1-5 years); NA (<1 years)

- 1st injector (600mg) IM
- 2nd injector (600mg) IM 10-15 min after 1st injector
- 3rd injector (600mg) IM in rapid succession, not to exceed 3 in 1 hour

MANAGEMENT STRATEGY 5

Perform Medical Management (ABCD Treatment)- Continued…

4. **Administer Drugs** – Antidote, Symptom Management Continued…

Diazepam (CANA): Control convulsions

CANA Auto Injector

- 1 injector (10mg) IM IF patient receives 2 PAMCL or Atropine doses
- 2-3 injectors (10-20mg) IM for seizing patients as needed

Atropine Ophthalmological Ointment: At Battalion Aid Station (BAS) apply Atropine Ophthalmic Ointment (topical); 0.5" strip in pocket of lower eyelid. Relieve eye symptoms.

MANAGEMENT STRATEGY 6

Perform Medical Management (ABCD Treatment) Continued…

- **Re-assess & Monitor Patient**
  - **Supportive Treatment** – Intravenous fluids, respiratory support.
  - **Stabilize Patient** – Continue drug therapy as needed for persistent symptoms.
  - **Identify Treatment Effects.**
  - **Identify Clinical Mismanagement Effects.**

DECONTAMINATION

Decontamination

- Remove contaminated clothing and gear. Decontaminate exposed skin in the following order:
- Face
- Neck area
- Chest area
- Abdomen
- Arms and hands
- Other exposed skin areas

DECONTAMINATION

Decontamination

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- Face
- Neck area
- Chest area
- Abdomen
- Arms and hands
- Other exposed skin areas

DISPOSITION PATIENT

Disposition Patient

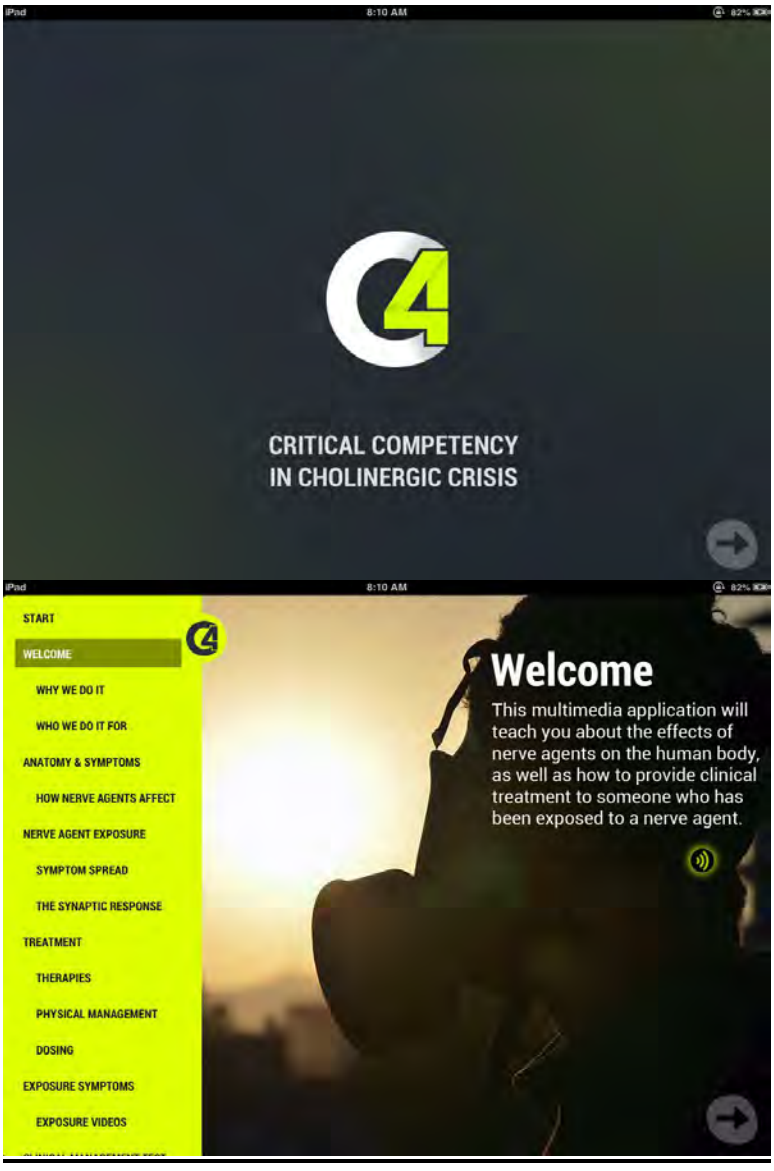
- Medical transport to appropriate Level 2 receiving facility (if possible)
- Field stabilization and monitoring if transport not available.

Multimedia Exercises with Multimedia

Multimedia training about how chemical and nerve agents effect physiological functioning, and how the antidotes modify the physiological outcomes will include one of the following conditions:

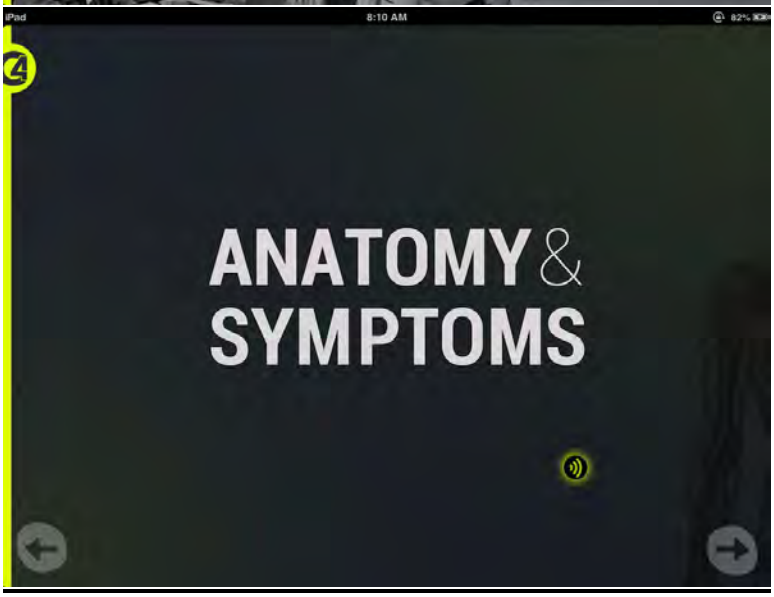
- Live animal response and recovery from a cholinergic event
- Animated human response and recovery from a cholinergic event

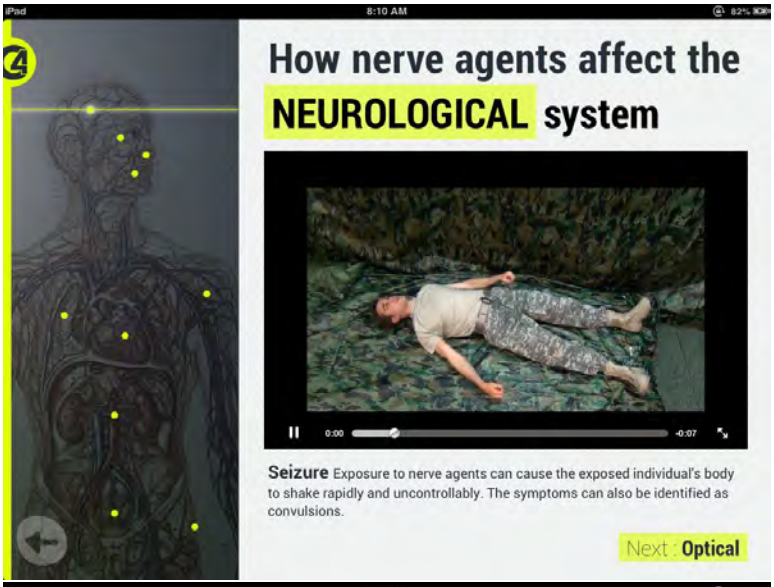
Multimedia training will take place over 30-45 minutes. The full multimedia application can be downloaded and viewed on an iPad using Testflight (username: c4study@gmail.com; password: cholinergic). To download the application, navigate to testflightapp.com and log in using the information above. Click the "Install Apps" tab and tap the C4 app to install. The C4 application can be interchanged between animal and human, using the C4 "Application Mode" toggle in the "Settings" menu of the iPad. Animal mode is activated when the Monkey toggle is "On" in the C4 section of the "Settings" menu. Human/simulator mode is activated when the Monkey toggle is "Off" in the C4 section of the "Settings" menu.

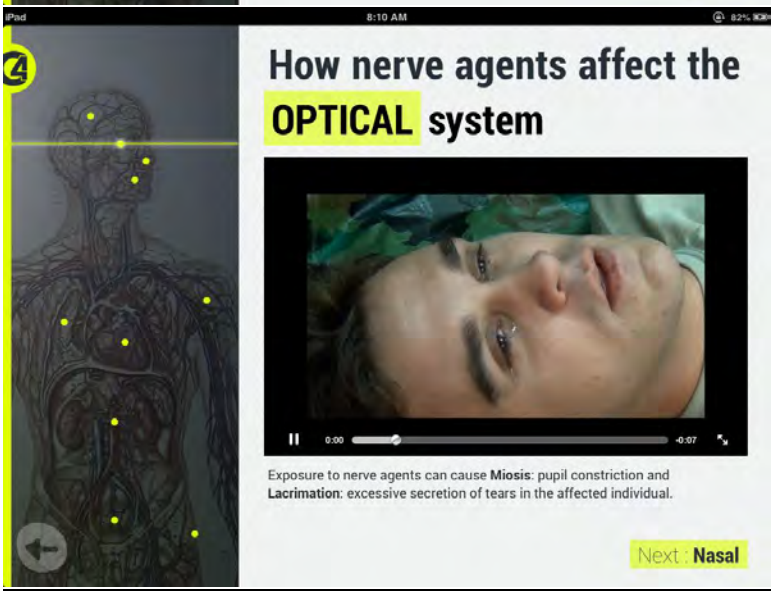


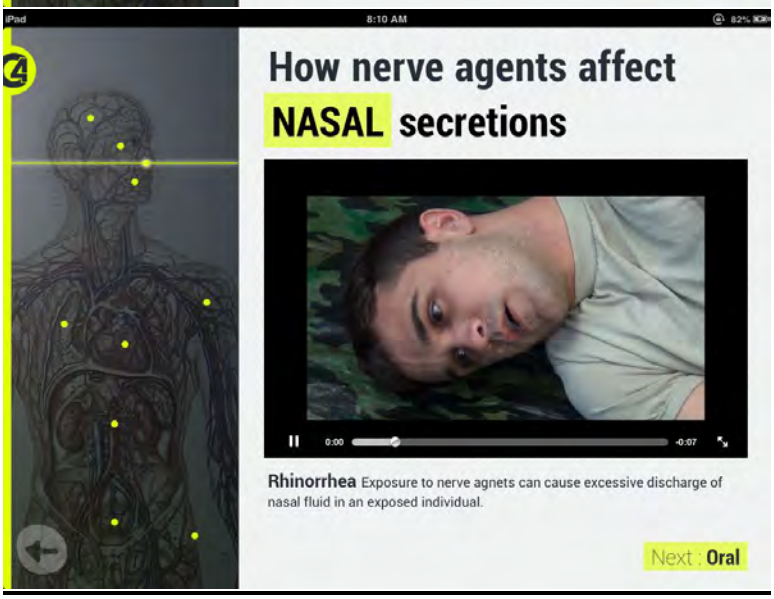

iPad
8:10 AM
Why we do it
Nerve agents can affect all members of a population. Training is essential to enable first-responders to correctly recognize and manage nerve agent exposure in affected individuals.

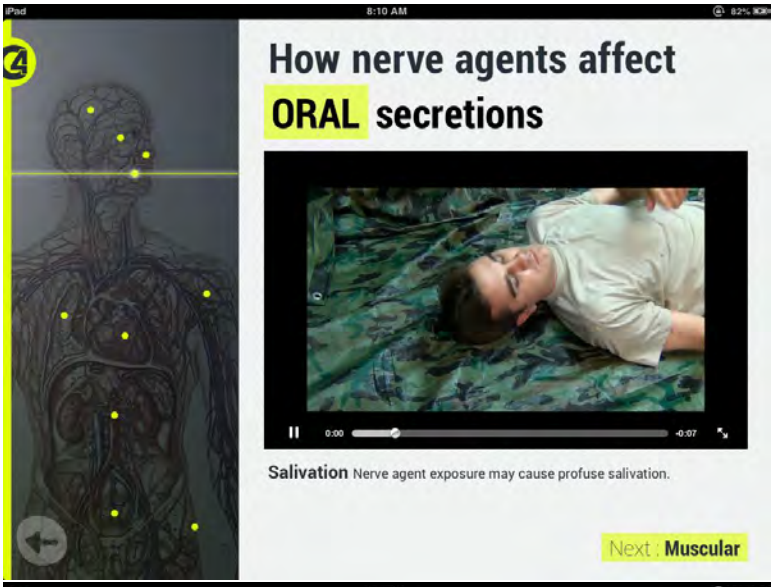

iPad
8:10 AM
Who we do it for
Nerve agents have been used in terror attacks in major cities throughout the world. Large stockpiles of chemical nerve agents pose a significant risk if obtained by terrorist groups. Despite the serious threat, proper training of medical professionals can prevent serious complications and loss of life in exposed populations.
New York Times

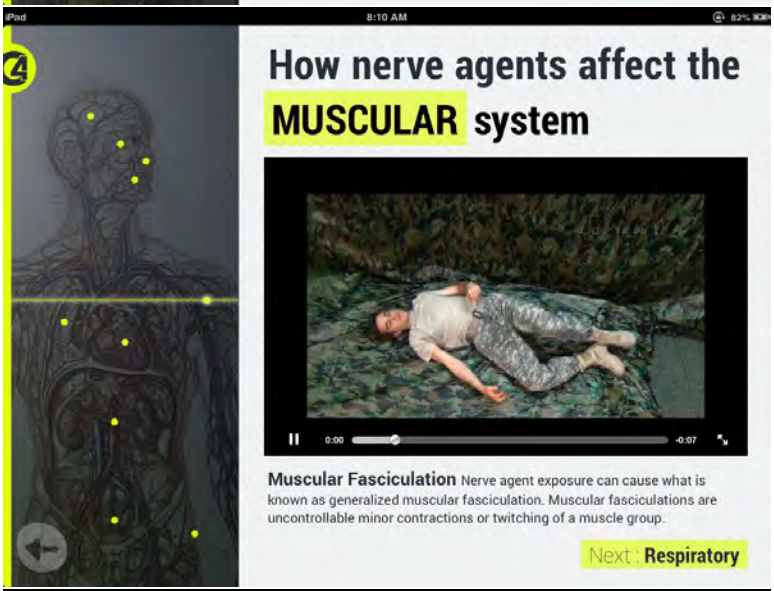

iPad
8:10 AM
ANATOMY &
SYMPTOMS

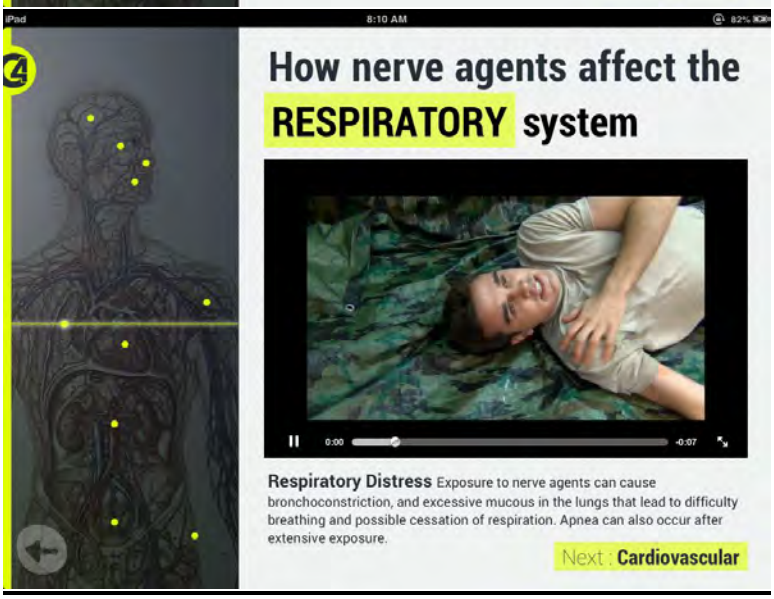

iPad
8:10 AM
How nerve agents affect the
NEUROLOGICAL system
0:00
-0:07
Seizure Exposure to nerve agents can cause the exposed individual's body to shake rapidly and uncontrollably. The symptoms can also be identified as convulsions.
Next : Optical

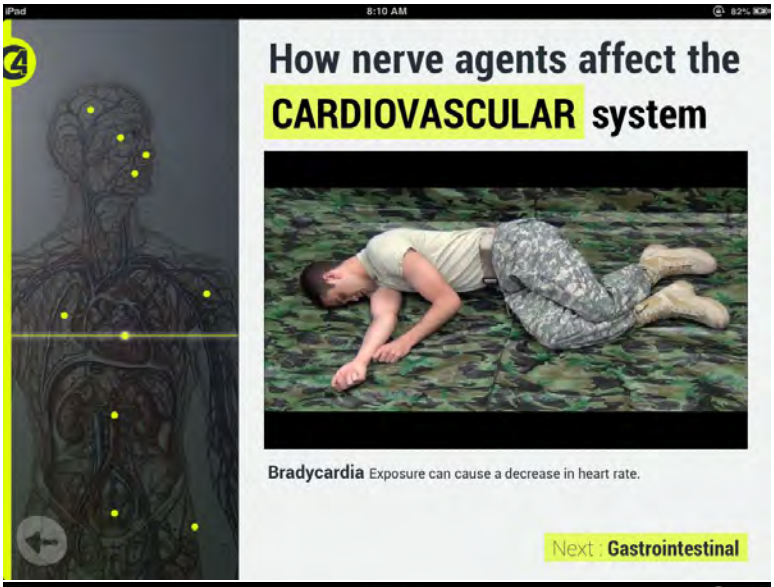

iPad
8:10 AM
How nerve agents affect the
OPTICAL system
0:00
-0:07
Exposure to nerve agents can cause Miosis: pupil constriction and Lacrimation: excessive secretion of tears in the affected individual.
Next : Nasal


iPad
8:10 AM
How nerve agents affect
NASAL secretions
0:00
-0:07
Rhinorrhea Exposure to nerve agnets can cause excessive discharge of nasal fluid in an exposed individual.
Next : Oral

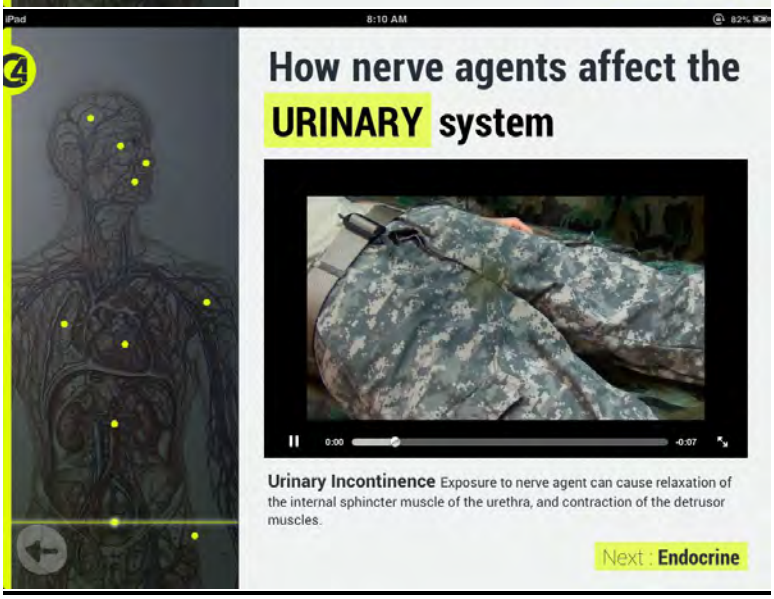

iPad
8:10 AM
How nerve agents affect
ORAL secretions
0:00
-0:07
Salivation Nerve agent exposure may cause profuse salivation.
Next : Muscular

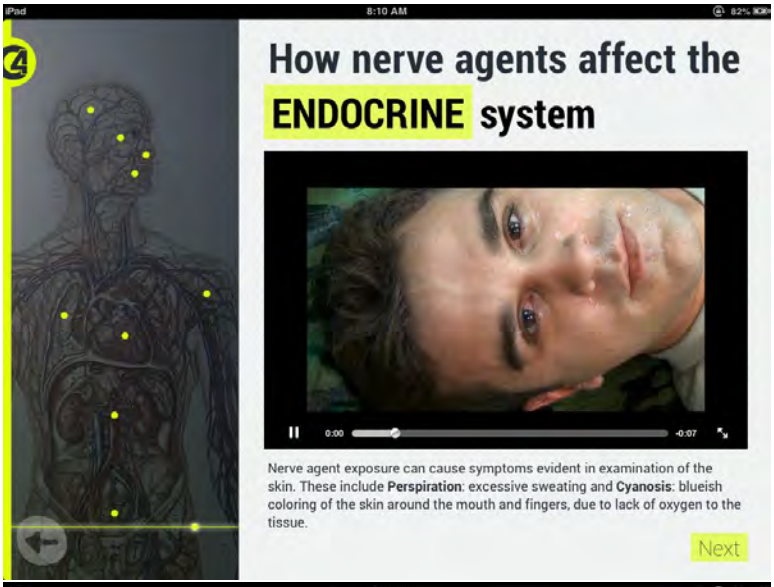

iPad
8:10 AM
How nerve agents affect the
MUSCULAR system
0:00
-0:07
Muscular Fasciculation Nerve agent exposure can cause what is known as generalized muscular fasciculation. Muscular fasciculations are uncontrollable minor contractions or twitching of a muscle group.
Next : Respiratory

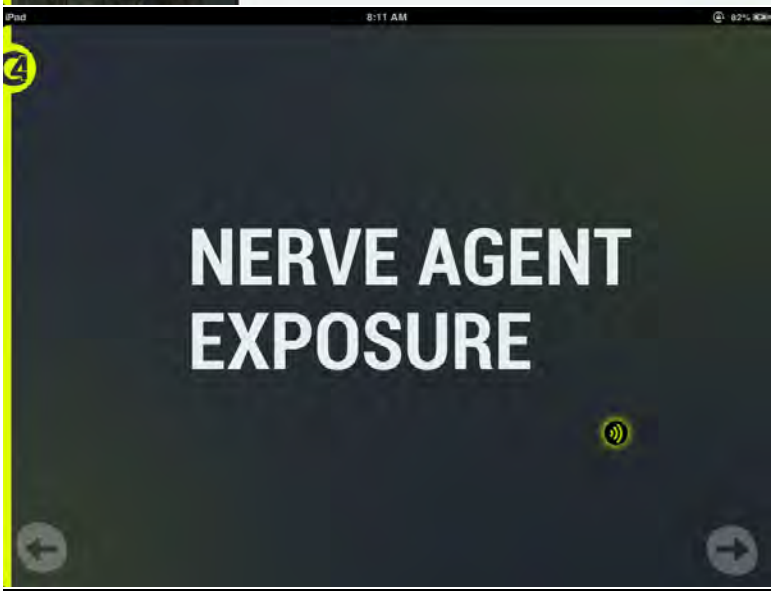

iPad
8:10 AM
How nerve agents affect the
RESPIRATORY system
0:00
-0:07
Respiratory Distress Exposure to nerve agents can cause bronchoconstriction, and excessive mucous in the lungs that lead to difficulty breathing and possible cessation of respiration. Apnea can also occur after extensive exposure.
Next : Cardiovascular

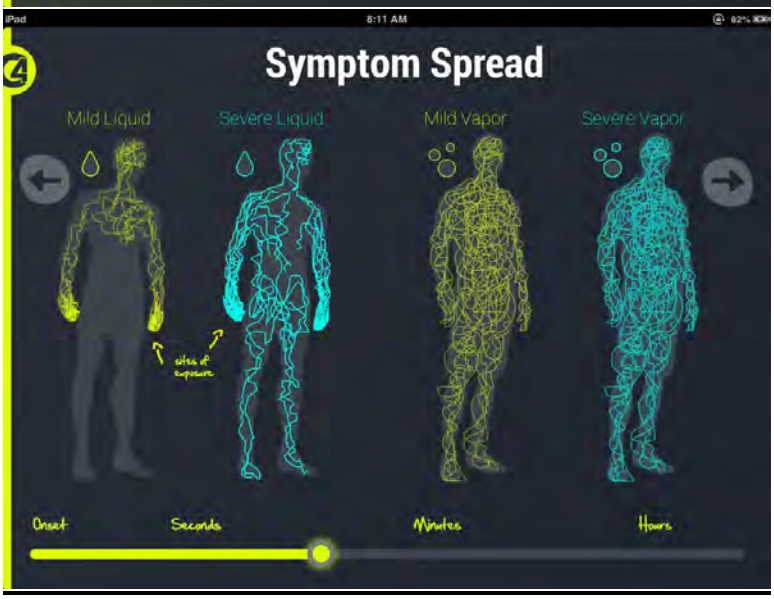

iPad
8:10 AM
How nerve agents affect the
CARDIOVASCULAR system
Bradycardia Exposure can cause a decrease in heart rate.
Next : Gastrointestinal

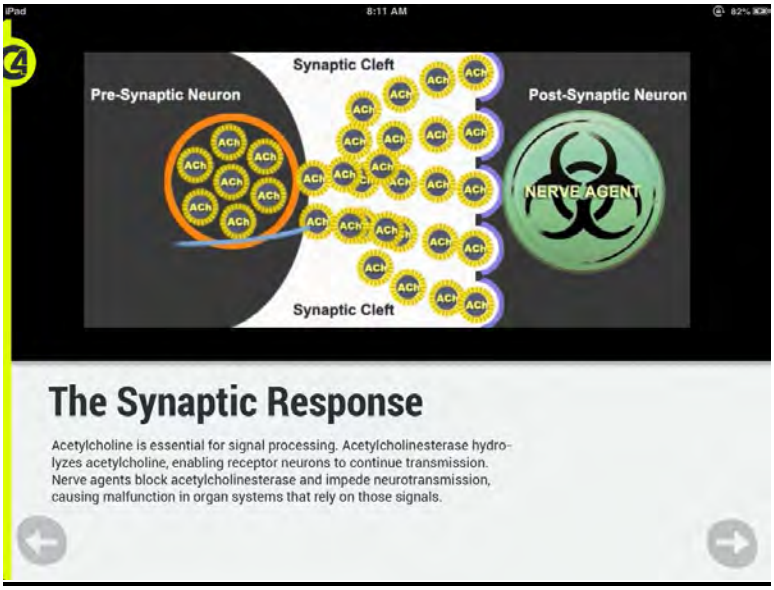

iPad
8:10 AM
How nerve agents affect the
GASTROINTESTINAL system
Nerve agent exposure can lead to an increase in gastrointestinal motility leading to Gastrointestinal Distress: smooth muscle tone changes causing gastrointestinal problems, Emesis: vomiting, and Bowel Incontinence: relaxation of the internal sphincter.
Next : Urinary


iPad
8:10 AM
How nerve agents affect the
URINARY system
Urinary Incontinence Exposure to nerve agent can cause relaxation of the internal sphincter muscle of the urethra, and contraction of the detrusor muscles.
Next : Endocrine


iPad
8:10 AM
How nerve agents affect the
ENDOCRINE system
0:00
-0:07
Nerve agent exposure can cause symptoms evident in examination of the skin. These include Perspiration: excessive sweating and Cyanosis: blueish coloring of the skin around the mouth and fingers, due to lack of oxygen to the tissue.
Next

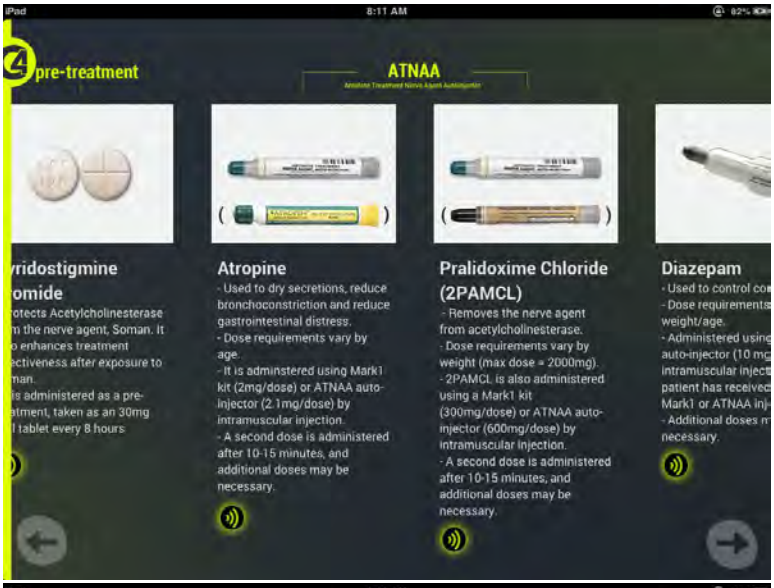

iPad
8:11 AM
NERVE AGENT
EXPOSURE


iPad
8:11 AM
Symptom Spread
Mild Liquid
Severe Liquid
Mild Vapor
Severe Vapor
sites of exposure
Onset
Seconds
Minutes
Hours



The Synaptic Response

Acetylcholine is essential for signal processing. Acetylcholinesterase hydrolyzes acetylcholine, enabling receptor neurons to continue transmission. Nerve agents block acetylcholinesterase and impede neurotransmission, causing malfunction in organ systems that rely on those signals.



ridostigmine omide

otects Acetylcholinesterase
n the nerve agent, Soman. It
o enhances treatment
ectiveness after exposure to
man.
is administered as a pre-
tment, taken as an 30mg
l tablet every 8 hours

Atropine

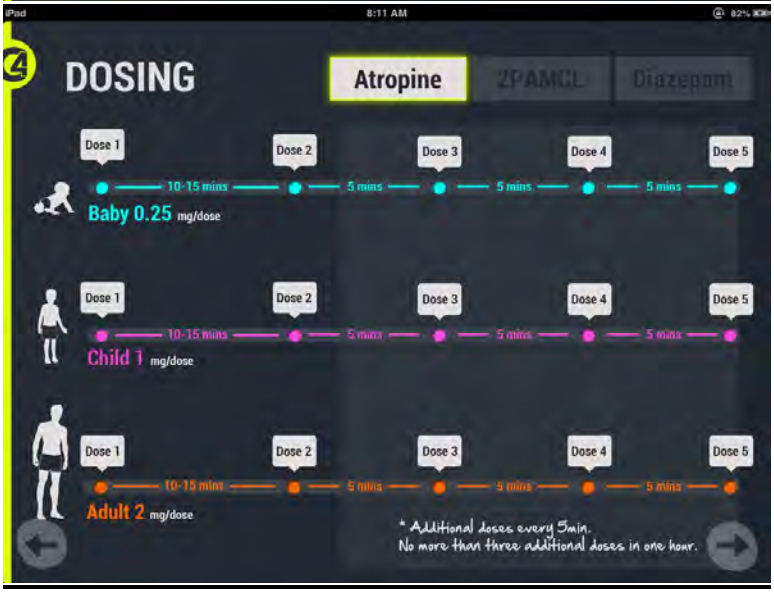
- Used to dry secretions, reduce bronchoconstriction and reduce gastrointestinal distress.
- Dose requirements vary by age.
- It is adminstered using Mark1 kit (2mg/dose) or ATNAA auto-injector (2.1mg/dose) by intramuscular injection.
- A second dose is administered after 10-15 minutes, and additional doses may be necessary.

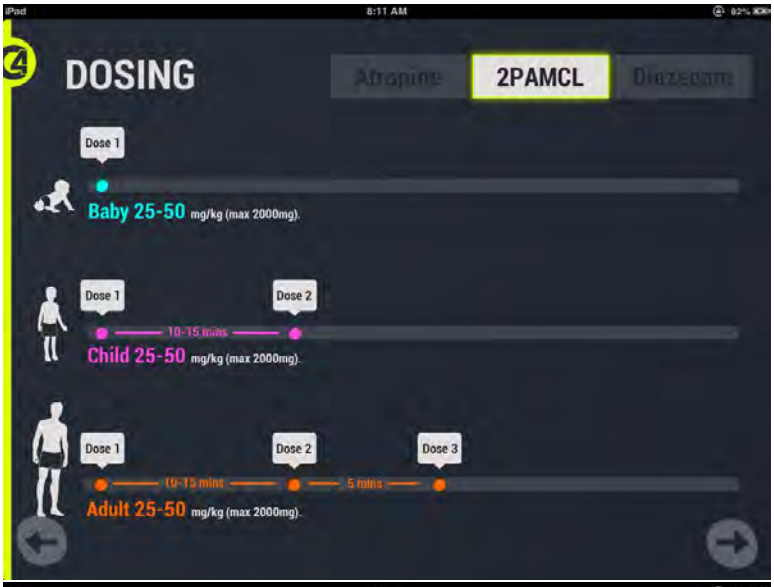
Pralidoxime Chloride (2PAMCL)

- Removes the nerve agent from acetylcholinesterase.
- Dose requirements vary by weight (max dose = 2000mg).
- 2PAMCL is also administered using a Mark1 kit (300mg/dose) or ATNAA auto-injector (600mg/dose) by intramuscular injection.
- A second dose is administered after 10-15 minutes, and additional doses may be necessary.

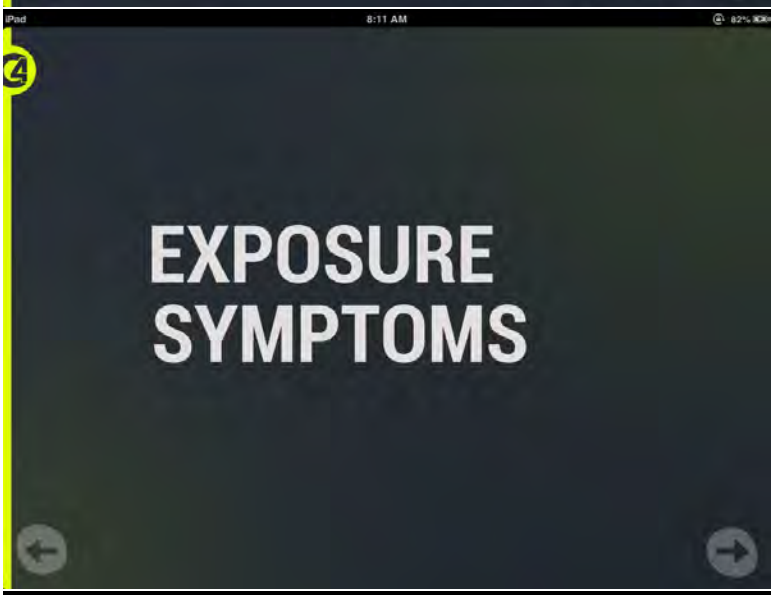
Diazepam

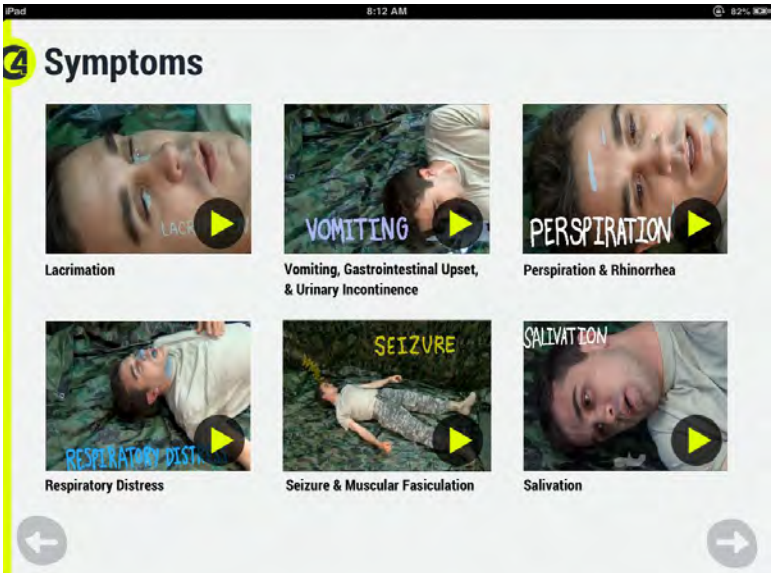
- Used to control co
- Dose requirements
weight/age.
- Administered using
auto-injector (10 mg
intramuscular inject
patient has received
Mark1 or ATNAA inj
- Additional doses n
necessary.

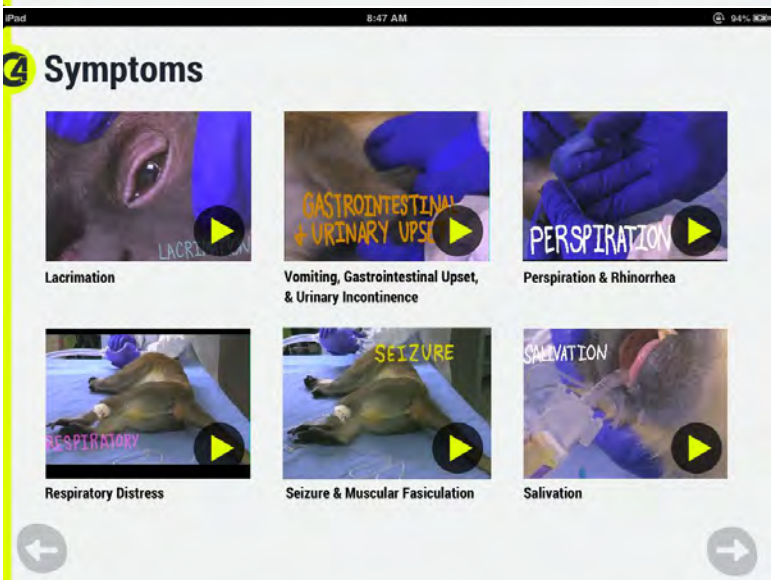



iPad
8:11 AM
4
DOSING
Atropine
2PAMCL
Diazepam
Dose 1
Baby 25-50 mg/kg (max 2000mg).
Dose 1
Dose 2
10-15 mins
Child 25-50 mg/kg (max 2000mg).
Dose 1
Dose 2
Dose 3
10-15 mins
5 mins
Adult 25-50 mg/kg (max 2000mg).

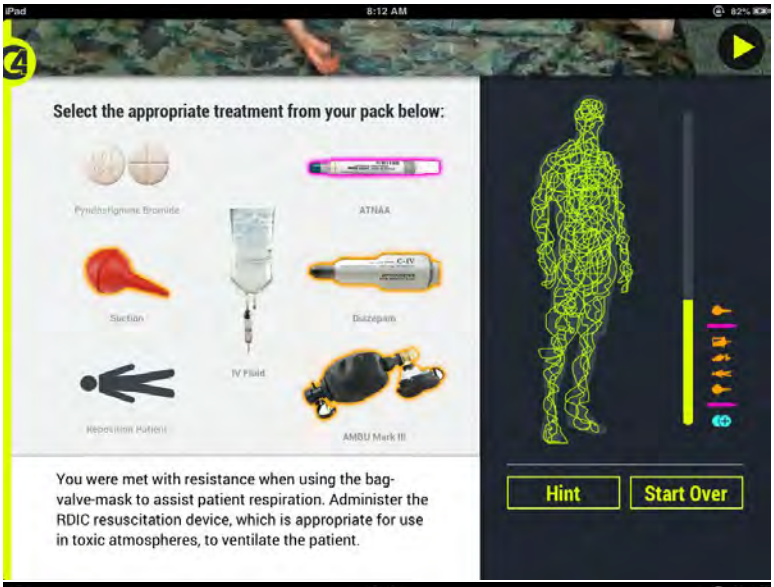

iPad
8:11 AM
4
DOSING
Atropine
2PAMCL
Diazepam
Dose 1
Dose 2
Dose 3
5 mins
5 mins
Baby 0.3 mg/dose
Dose 1
Dose 2
Dose 3
5 mins
5 mins
Child 0.5 mg/dose
Dose 1
Dose 2
Dose 3
5 mins
5 mins
Adult 10 mg/dose
* Administer first dose if patient received THREE ATNAA/ Mark I kit auto injectors (20 min)

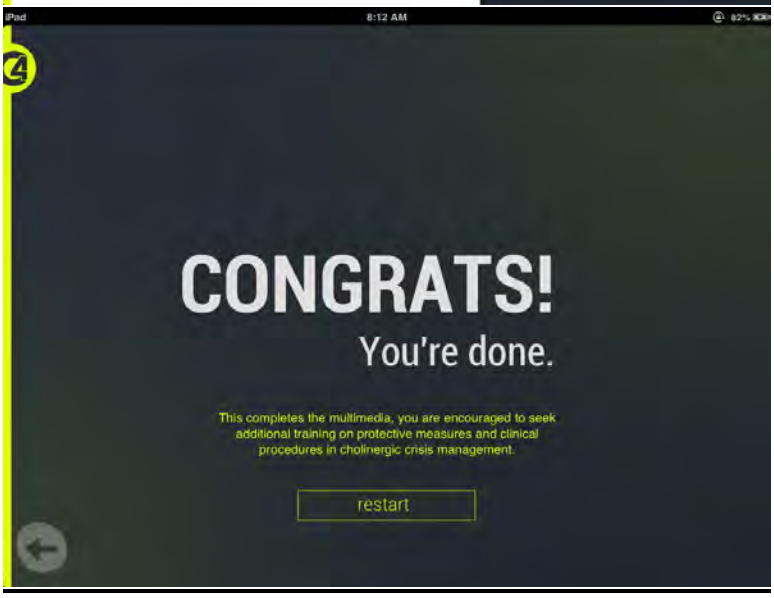

iPad
8:11 AM
4
EXPOSURE
SYMPTOMS


iPad
8:12 AM
Symptoms
VOMITING
PERSPIRATION
SEIZURE
SALIVATION
Lacrimation
Vomiting, Gastrointestinal Upset, & Urinary Incontinence
Perspiration & Rhinorrhea
Respiratory Distress
Seizure & Muscular Fasiculation
Salivation


iPad
8:47 AM
Symptoms
PERSPIRATION
SEIZURE
SALIVATION
Lacrimation
Vomiting, Gastrointestinal Upset, & Urinary Incontinence
Perspiration & Rhinorrhea
Respiratory Distress
Seizure & Muscular Fasiculation
Salivation


iPad
8:12 AM
0:00
-0:38
Clinical Management Test
Instructions: Watch the video above, then move to the next page to complete a series of questions testing your knowledge.


iPad
8:12 AM
Select the appropriate treatment from your pack below:
ATNAA
Suction
Diazepam
IV Fluid
AMBU Mark III
You were met with resistance when using the bag-valve-mask to assist patient respiration. Administer the RDIC resuscitation device, which is appropriate for use in toxic atmospheres, to ventilate the patient.
Hint
Start Over


iPad
8:12 AM
CONGRATS!
You're done.
This completes the multimedia, you are encouraged to seek additional training on protective measures and clinical procedures in cholinergic crisis management.
restart

Simulation Exercises with SimMan3G

Programmed case scenarios will be presented for training and practice with the SimMan3G mannequin simulator:

- Moderate exposure, Vapor

Hands-on simulation training will include 30-45 minutes.

SimMan3G Scenario Progression

Initial State
Vitals: BP 85/45, HR 60, RR 28, O2 88%

Cough, Vomit sounds
Nasal, eye secretions
Lung Resistance
Coarse breath and Lung sounds
Seizure

Trend 0-5min
Vitals: BP 78/40, HR 40, RR 36, O2 82%
Trend 5-15min
Vitals: BP 62/40, HR 34, RR 8, O2 68%,

Trend 15-17min
Vitals: BP -, HR 0 , RR 0, O2 -

ATNAA (Round 1)
No change in vitals

BVM
No change in vitals

IV Fluid Given
Trend - 7 minutes
Vitals: BP 90/64

ATNAA (Round 2)
No change in vitals

Ambu Military III
No change in vitals

ATNAA (Round 3)
Trend - 2 minutes
Vitals: RR 20, BP 100/60, HR 80, O2 95%
Stop nasal/eye secretions
stop vomiting

Intubation
Trend - 2 min
Vitals - O2 98%

Diazepam Given
Trend: 5 minutes
Vitals: RR 16, O2 92%,
Seizures stop.

SimMan3g TEACHING PROTOCOL

Notes:

- Use terminology as indicated.
- Do NOT vary the protocol from below.
- Do NOT ad-lib content or add content that differs or departs from that indicated below.
- Refer all content related questions to Dr. Andreatta.
- Do NOT assume correct responses to questions or base responses off your knowledge. Following the protocol EXACTLY is essential.

TEACHING SEQUENCE

1. Orient the subjects to the SimMan3G

2. Tell the subjects they will learn to

- Recognize the symptoms of cholinergic crisis
- Perform the clinical tasks associated with medical management of cholinergic crisis

3. Tell subjects to request the following information from the conscious patient:

- Do they have any PAIN?
- Any GASTROINTESTINAL or URINARY DISTRESS?
- DIFFICULTY BREATHING?
- Assess the patient's MUSCLE CONTROL by having them squeeze your hand.
- Determine patient's MENTAL STATUS by asking them where they are.
- Ask if ANYTHING ELSE IS BOTHERING them.

4. Instruct subjects to perform a full body patient assessment by checking for the following indicators:

- Eyes - Miosis
- Mouth - copious secretions
- Nose - copious secretions
- Respiratory Effort - respiratory distress, Cyanosis
- Muscle control - yes/no, muscular fasciculations
- Pulse – bradycardia, variable rhthym
- Neurological – mental status, convulsions/seizure
- Other physical symptoms
    - Incontinence
    - Fatigue
    - Paralysis

*******SUBJECTS PRACTICE Items 3 & 4 *****

5. Teach subjects how to provide Clinical Management of the patient through the following:

- Suction – demonstrate how to suction

- Position patient on side
  – demonstrate how to position patient on the side using subjects

- Bag-valve-mask ventilation
  - demonstrate how to use BVM

- ATNAA auto-injector administration (includes 1 dose of 2PAMCL & Atropine)
  - demonstrate how to use ATNAA auto-injector

- IV placement - demonstrate how to place IV.
  Indicate that training for IV access is not part of this course for safety purposes.

********* SUBJECTS PRACTICE Item 5 **********

6. Instruct subjects to continue providing Clinical Management of the patient through the following:
   - Suction as needed
   - Second ATNAA auto-injector administration (2nd dose of 2PAMCL & Atropine)
   - RDIC – demonstrate how to use RDIC
   - Reassess patient

********* SUBJECTS PRACTICE Item 6 **********

7. Instruct subjects to continue providing Clinical Management of the patient through the following:
   - Suction as needed
   - Third ATNAA auto-injector administration (3rd dose of 2PAMCL & Atropine)
   - CANA auto-injector (includes 1 dose of Diazepam) for seizures/convulsions
     - demonstrate how to use CANA auto-injector.
   - Reassess patient

********* SUBJECTS PRACTICE Item 7 **********

8. Teach subjects that if the patient loses consciousness, they should intubate the patient to secure the airway.
   - Demonstrate how to use Intubate.
   - Remind subjects that IF PATIENT IS CONSCIOUS DO NOT INTUBATE.

9. Teach subjects to call for patient transport to a Level 2 facility and maintain supportive treatment until patient is either stable or handed-off to transport team.

Simulation Exercises with Standardized Patients

Five case scenarios will be presented for training and practice in the recognition and response to a cholinergic event using simulated patients representing five similar symptomologies, only one of which is a cholinergic event:

- Nerve agent exposure
- Vesicant exposure

Hands-on simulation training will include 30 minutes.

Appendix 9: Training Event Images

IMAGES FROM PEDIATRIC/NEONATAL INTUBATION TRAINING

Figure 1 Subjects don protective gear prior to entering the surgical area to practice intubation on an anesthetized cat.

Figure 2 Veterinary students observe and assist subjects performing intubation.

Figure 3 Licensed veterinary technicians supervise participants during intubation procedures.

Figure 4 After being intubated by study subjects cats are spayed or neutered by veterinary students as part of Michigan State University College of Veterinary Medicine's spay/neuter program.

Figure 5 Prior to and after training, subjects are assessed on their ability to perform the procedural steps associated with intubation on pediatric and neonatal simulators.

Figure 6 Subjects are provided with standard equipment and instruments to perform intubation.

Figure 7 Raters use the performance assessment instrument to mark competencies subjects perform during assessment activities.

Figure 3 Raters greet subjects and enter administrative data, prior to the initiation performance assessment activities.

Figure 4 Subjects, raters and standardized patient actors during performance assessment activities.

Figure 5 Subject assesses distractor patient actor.

Figure 6 Subject reassesses nerve agent exposure patient after performing airway management on an airway manikin with RDIC.

Figure 7 Subject administers airway management to airway manikin in order to provide to the standardized patient.

Figure 8 Rater marks completed competency points as subject administers ANTAA to nerve agent exposure patient.

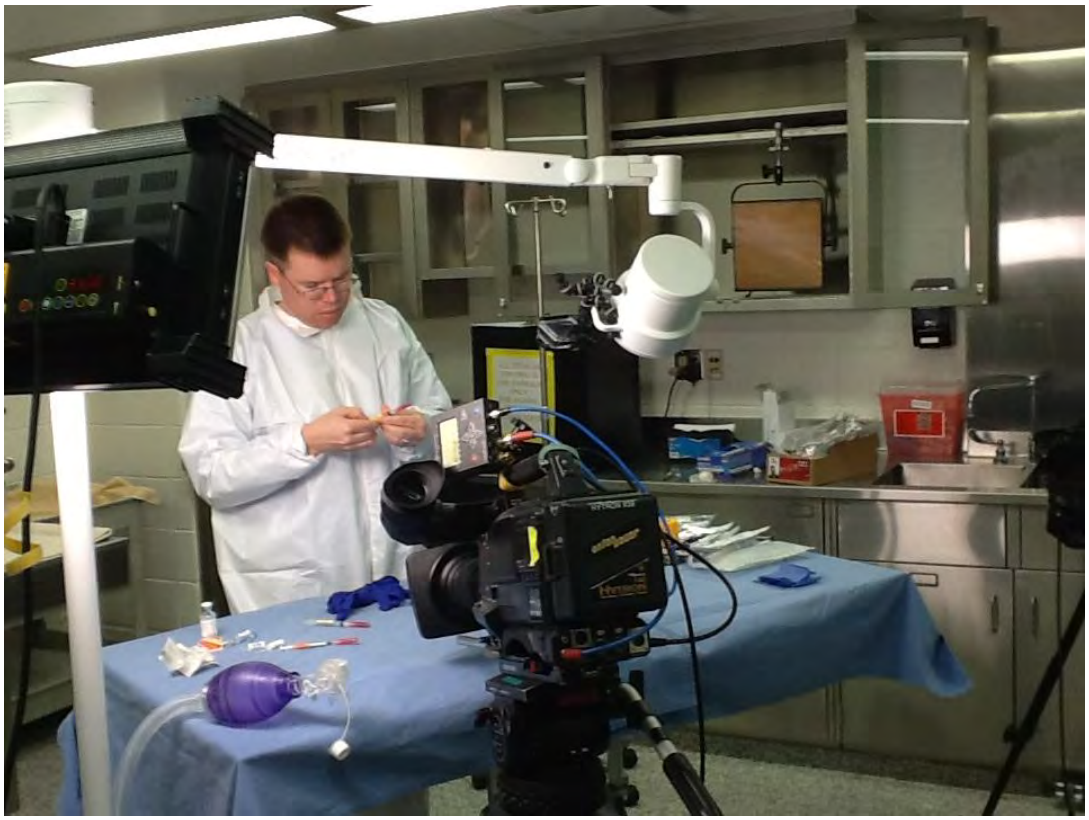


Figure 9 Video production for the animal component of the cholinergic crisis multimedia application was conducted in a surgical suite at the University of Missouri.

Figure 10 The African Green Monkey was carefully monitored by licensed veterinary medical professionals from onset of cholinergic crisis to resolution.

Appendix 10: Validity and Reliability Statistics

VALIDITY AND RELIABILITY STATISTICS

Validity Analyses

All assessment instruments were reviewed by experts (N=5) in the field of pediatric and neonatal intubation to confirm content validity. Statistical calculations (ANOVA) to evaluate the construct validity for each of the five assessment instruments are presented in Table 2. Each assessment instrument yielded results such that experts performed significantly better from intermediate level subjects, who in turn performed significantly better from novices, who performed significantly better from those with no experience. Statistical significance was set at $p<0.5$. The level of significance between the performance of all groups (levels of expertise) was $p= .000$ for the content-related assessment instruments, but lower for the affective state assessment ($p = .023$).

Table 2. – Construct Validity Statistics: Pediatric and Neonatal Intubation Assessment Instruments

		Sum of Squares	df	Mean Square	F	Sig.
Pediatric/Neonatal Affective Inventory	Between Groups	1675.173	3	558.391	3.249	.023
	Within Groups	36093.201	210	171.872		
	Total	37768.374	213			
Pediatric/Neonatal Intubation Self-Efficacy	Between Groups	9896.274	3	3298.758	99.287	.000
	Within Groups	7309.365	220	33.224		
	Total	17205.638	223			
Pediatric/Neonatal Intubation Cognitive Test	Between Groups	6304.302	3	2101.434	113.280	.000
	Within Groups	4081.158	220	18.551		
	Total	10385.460	223			
Neonatal Intubation Performance	Between Groups	11144.383	3	3714.794	65.479	.000
	Within Groups	12254.326	216	56.733		
	Total	23398.709	219			
Pediatric Intubation Performance	Between Groups	11516.004	3	3838.668	44.585	.000
	Within Groups	19027.552	221	86.098		
	Total	30543.556	224			

Reliability Analyses

Statistical calculations (Cronbach's alpha) to evaluate internal consistency for each of the five assessment instruments are presented in Table 1. Each assessment instrument was designed to be used in the pediatric and neonatal intubation study or cholinergic crisis recognition and management study and demonstrated excellent reliability (alpha > .80).

Table 1. – Reliability Statistics: Pediatric and Neonatal Intubation Assessment Instruments

Assessment Instrument	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Pediatric/Neonatal Affective Inventory	.953	.955	38
Pediatric/Neonatal Intubation Self-Efficacy	.944	.952	12
Pediatric/Neonatal Intubation Cognitive Test	.880	.876	60
Neonatal Intubation Performance	.844	.914	47
Pediatric Intubation Performance	.816	.916	47

Appendix 11: Preliminary Data

Table 3: DEMOGRAPHICS FOR PEDIATRIC/ NEONATAL INTUBATION ARM
By Profession

	JULY	AUGUST	OCTOBER	NOVEMBER	JANUARY	FEBRUARY	APRIL	TOTAL
MD/DO	**5**	**8**	**20**	**24**	**5**	**1**	**6**	**80**
Peds - House Officer	1	1	7	1	5	0	0	15
Peds Hematology/Oncology - House Officer	0	0	1	0	0	0	0	1
Peds and Communicable Diseases - House Officer	0	4	0	6	0	1	3	13
PICU – House Officer	0	0	0	0	0	0	1	1
Neonatology – House Officer	0	0	0	0	0	0	1	1
Emergency - House Officer	4	2	9	8	0	0	0	25
Anesthesiology - House Officer	0	0	0	7	0	0	0	17
Peds - Attending	0	0	1	0	0	0	0	1
Emergency - Attending	0	1	1	2	0	0	1	5
Unknown - MD	0	0	1	0	0	0	0	1
EMS/RN	**1**	**2**	**26**	**28**	**7**	**19**	**7**	**109**
Peds Nephrology - Nurse Practitioner	0	0	1	0	0	0	0	1
Peds Emergency - Registered Nurse	0	0	6	11	0	0	0	20
PICU - Registered Nurse	0	0	0	1	0	0	0	1
Emergency - Registered Nurse	0	0	6	5	0	0	0	13
Survival Flight - Registered Nurse	0	0	2	4	0	1	1	11
Anesthesia – Registered Nurse Anesthetist	0	0	0	0	1	0	0	1
Anesthesia - Nurse Anesthetist Student	0	0	0	0	7	2	0	9

	JULY	AUGUST	OCTOBER	NOVEMBER	JANUARY	FEBRUARY	APRIL	TOTAL
Trauma Burn ICU - Registered Nurse	0	0	0	1	0	0	0	1
Unknown - Registered Nurse	0	0	2	2	0	0	0	4
Emergency - Paramedic	0	0	0	3	0	0	0	3
Peds Emergency - Paramedic	0	0	4	1	0	0	0	6
Survival Flight - Paramedic	0	0	1	0	0	0	2	4
Emergency - Technician	0	0	1	0	0	0	0	1
Unknown - Paramedic	0	0	0	0	0	11	4	15
Unknown - EMS	1	2	3	0	8	7	0	21
DVM	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**2**
DDS – ORAL Maxillofacial Surgery	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**2**
Other Prof.	**4**	**3**	**0**	**0**	**0**	**0**	**0**	**7**
Med. Student	**3**	**5**	**16**	**28**	**0**	**0**	**0**	**52**
Vet. Student	**10**	**10**	**0**	**0**	**7**	**0**	**0**	**27**
EMS Student	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**
Other Student	**7**	**2**	**3**	**0**	**0**	**0**	**0**	**12**
TOTAL NUMBER	**31**	**31**	**65**	**102**	**29**	**23**	**13**	**294**

Table 4: PEDIATRIC/NEONATAL INTUBATION TRAINING GROUP DEMOGRAPHICS
By Profession

	LIVE CATS	SIMULATED CATS	TOTAL
MD/DO	**25**	**55**	**80**
Peds - House Officer	7	8	15
Peds Hematology/Oncology - House Officer	0	1	1
Peds and Communicable Diseases - House Officer	8	5	13
PICU – House Officer	1	0	1
Neonatology – House Officer	1	0	1
Emergency - House Officer	6	19	25
Anesthesiology - House Officer	0	17	17
Peds - Attending	0	1	1
Emergency - Attending	2	3	5
Unknown - MD	0	1	1
EMS/RN	**45**	**64**	**109**
Peds Nephrology - Nurse Practitioner	0	1	**1**
Peds Emergency - Registered Nurse	0	20	**20**
PICU - Registered Nurse	0	1	**1**
Emergency - Registered Nurse	0	13	**13**
Survival Flight - Registered Nurse	2	9	**11**
Anesthesia – Registered Nurse Anesthetist	1	0	**1**
Anesthesia - Nurse Anesthetist Student	9	0	**9**
Trauma Burn ICU - Registered Nurse	0	1	**1**
Unknown - Registered Nurse	0	4	**4**
Emergency - Paramedic	0	3	**3**
Peds Emergency - Paramedic	0	6	**6**
Survival Flight - Paramedic	2	2	**4**
Emergency - Technician	0	1	**1**
Unknown - Paramedic	15	0	**15**
Unknown - EMS	18	3	**19**
DVM	**2**	**0**	**2**
DDS – ORAL Maxillofacial Surgery	**1**	**1**	**2**
Other Prof.	**7**	**0**	**7**
Med. Student	**8**	**44**	**52**
Vet. Student	**27**	**0**	**27**
EMS Student	**1**	**0**	**3**
Other Student	**9**	**3**	**12**
TOTAL NUMBER	**127**	**167**	**294**

By Institution Affiliation

	LIVE CATS	SIMULATED CATS	TOTAL
Michigan State University	57	0	57
University of Michigan	28	167	205
Macomb Community College	8	0	8
Huron Valley Ambulance	1	0	1
Henry Ford Community College	2	0	2
Henry Ford Health System	2	0	2
City of Westland	1	0	1
Superior Air Ground Ambulance	5	0	5
Superior Township Fire Department	1	0	1
Northville Fire Department	5	0	5
Community EMS	2	0	2
City of Ann Arbor Fire Department	1	0	1
Medstar Ambulance	1	0	1
Milan Fire Department	1	0	1
Superior Air Med	1	0	1
Huron Township Fire Department	1	0	1
TOTAL NUMBER	**127**	**167**	**294**

By Gender

	LIVE CATS	SIMULATED CATS	TOTAL
Male	62	76	80
Female	65	91	15
TOTAL NUMBER	**127**	**167**	**294**

Table 5: CHOLINERGIC CRISIS TRAINING DEMOGRAPHICS

By Profession

	TRAINING		
Profession	**Live Animal**	**Simulated Animal**	**TOTAL**
MD	0	0	0
RN	8	7	15
EMS	44	44	88
Medical Student	19	13	32
TOTAL	**71**	**64**	**135**

By Military Affiliation

	TRAINING		
Military Medic - Branch	**Live Animal**	**Simulated Animal**	**TOTAL**
Army	5	1	6
Navy	0	2	2
Army National Guard	2	3	5
Air National Guard	1	0	1
Non-Member	63	58	121
TOTAL	**71**	**64**	**135**

By Gender

	TRAINING		
Gender	**Live Animal**	**Simulated Animal**	**TOTAL**
Female	24	27	51
Male	47	37	84
TOTAL	**71**	**64**	**135**

Table 6: PEDIATRIC/NEONATAL INTUBATION RETENTION TEST NTUBATION DEMOGRAPHICS

	TRAINING			RETENTION									
				6 weeks			18 weeks			52 weeks			
Profession	Live Animal	Simulated Animal	TOTAL	Live Animal	Simulated Animal	Sub-Total	Live Animal	Simulated Animal	Sub-Total	Live Animal	Simulated Animal	Sub-Total	TOTAL
MD	23	52	75	6	8	14	7	8	15	3	10	13	42
DO	2	3	5	1	1	2	0	1	1	0	0	0	3
DDS	1	1	2	0	0	0	0	1	1	0	0	0	1
RN	12	49	61	5	9	14	1	5	6	0	9	9	29
EMS	35	15	50	9	2	11	6	3	9	0	3	3	23
DVM	2	0	2	0	0	0	1	0	1	1	0	1	2
Other Professional	7	0	7	1	0	1	1	0	1	2	0	2	4
Medical Student	8	44	52	3	19	22	4	9	13	1	5	6	41
Veterinary Student	27	0	27	6	0	6	4	0	4	3	0	3	13
Other Student	9	3	12	1	0	1	2	0	2	2	1	3	6
EMS Student	1	0	1	1	0	1	0	0	0	0	0	0	1
TOTAL	**127**	**167**	**294**	33	39	**72**	26	27	**53**	12	28	**40**	**165**

Table 7. Heart Rate Variability, All Subjects

		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Mean	Training	79.94	9.799	-4.337	164	.000
	Retention	83.95	11.842			
Peak	Training	126.33	25.793	4.003	164	.000
	Retention	116.53	22.113			
Elevation	Training	46.39	24.450	6.349	164	.000
	Retention	32.58	18.464			

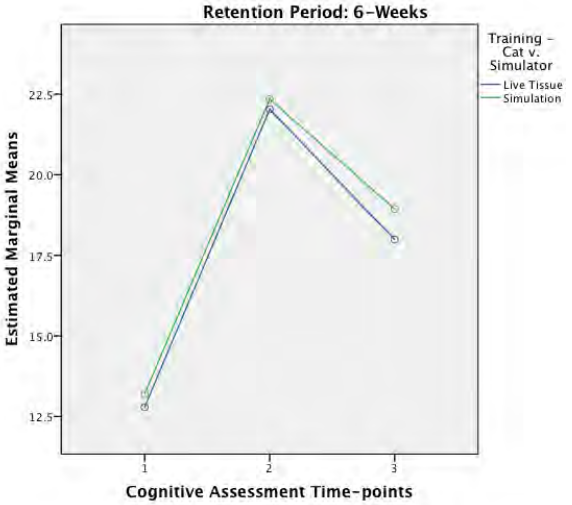
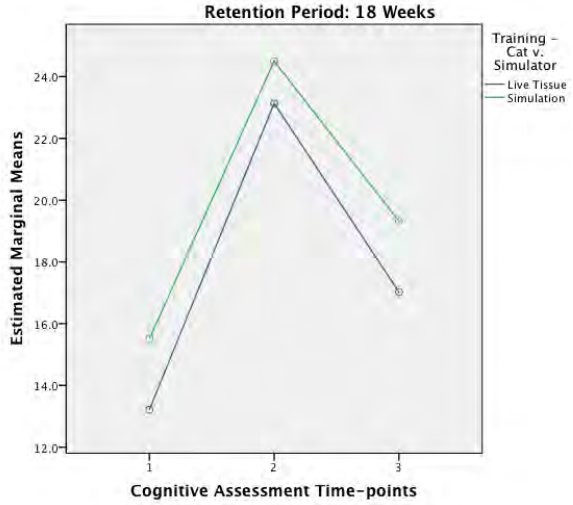
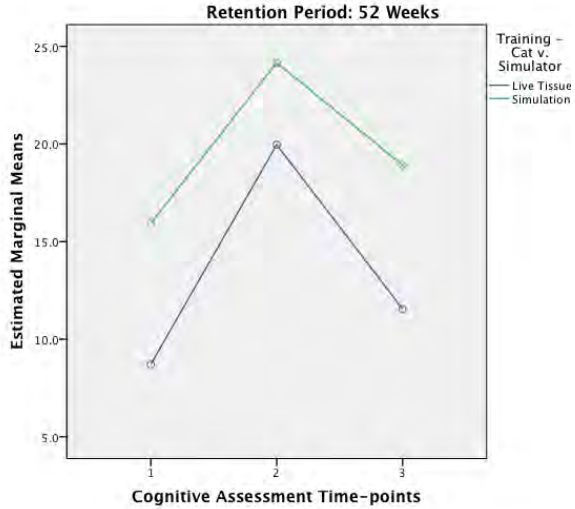
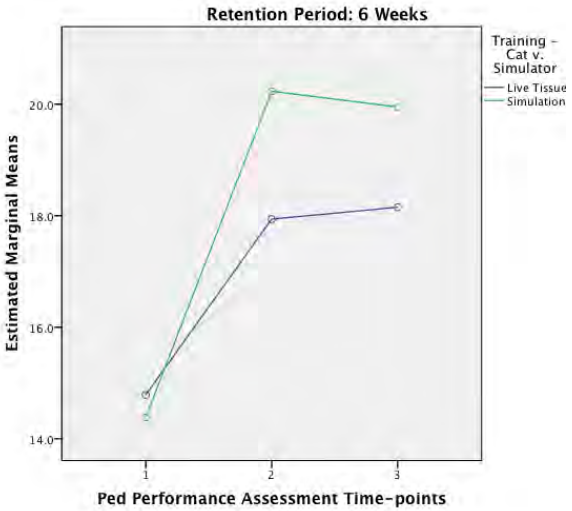
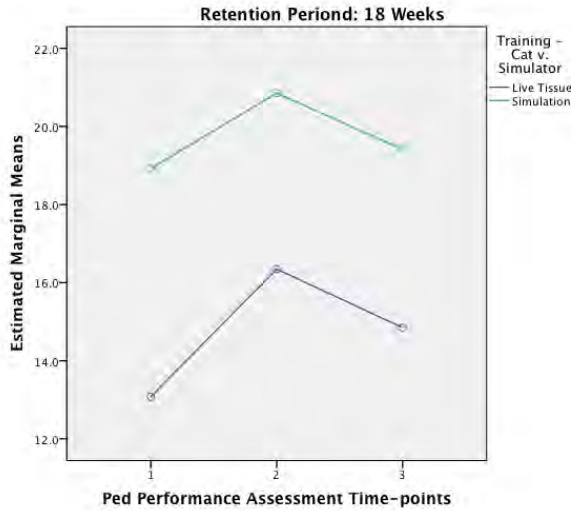
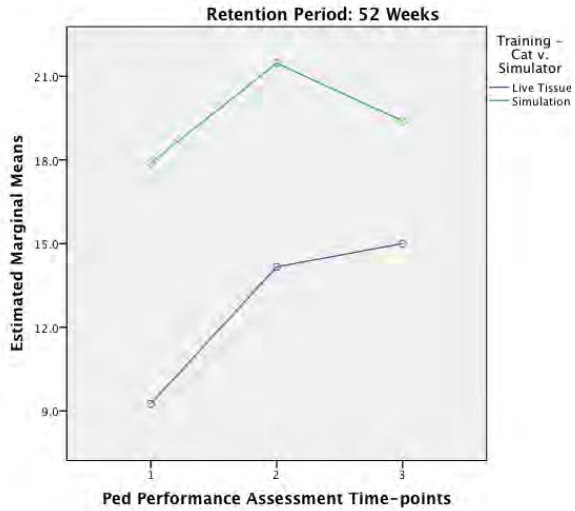
Table 8. Heart Rate Variability Between Subject Groups (Animal vs. Simulator) Initial Training

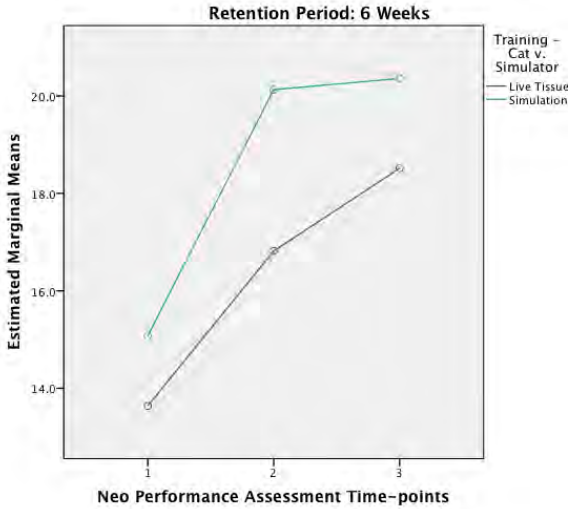
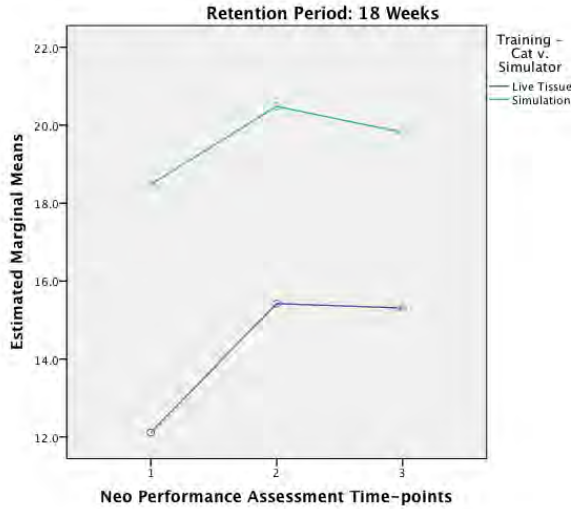
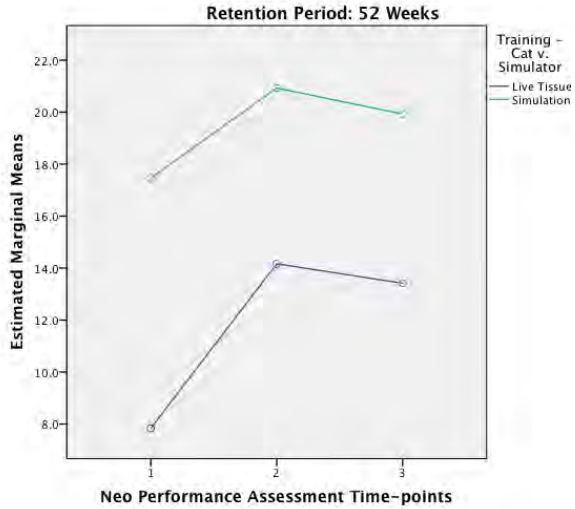
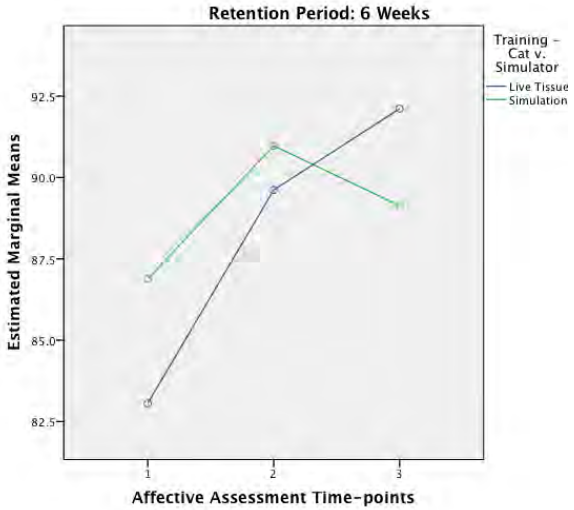
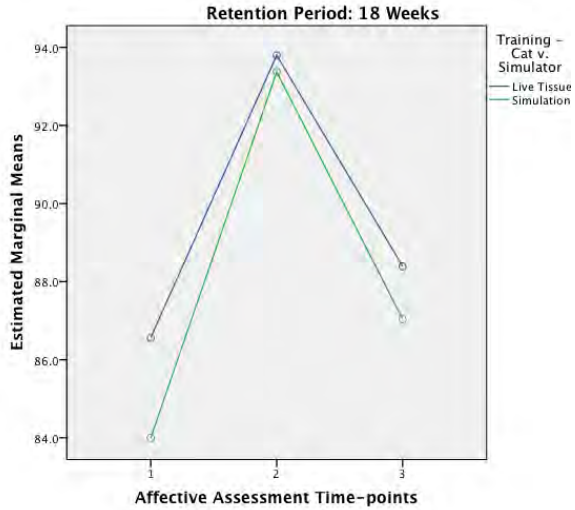
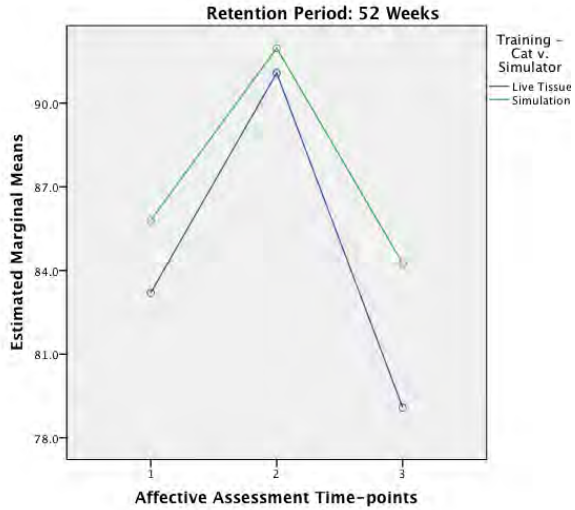
		Mean	N	Std. Deviation	F	df	Sig. (2-tailed)
Mean	Animal	81.98	127	10.134	.594	(1, 292)	N/S
	Simulation	80.98	167	10.215			
Peak	Animal	126.16	127	26.695	.010	(1, 292)	N/S
	Simulation	128.56	167	25.434			
Elevation	Animal	44.18	127	24.702	.000	(1, 292)	N/S
	Simulation	48.24	167	23.979			

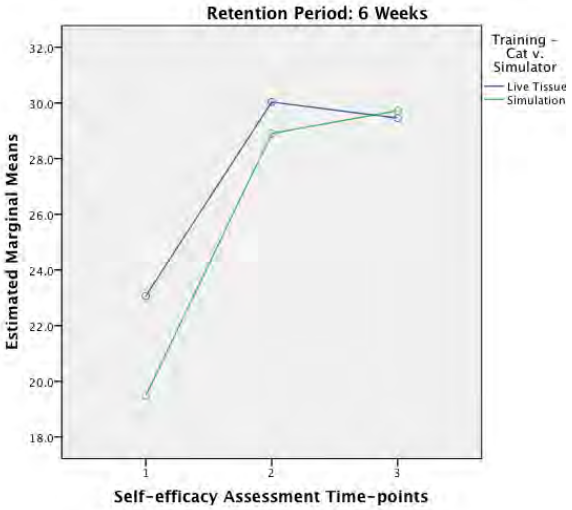
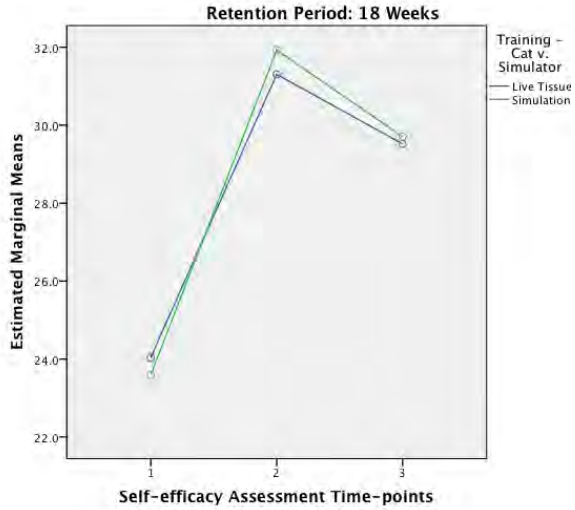
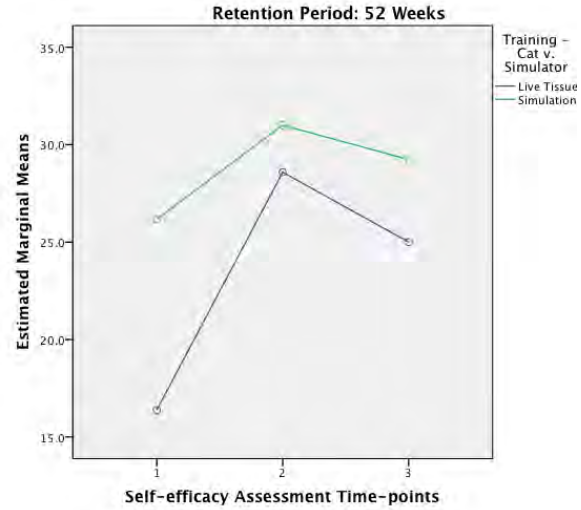
Table 9. Heart Rate Variability Between Subject Groups (Animal vs. Simulator) Retention Test

		Mean	N	Std. Deviation	F	df	Sig. (2-tailed)
Mean	Animal	82.70	71	11.542	.110	(1, 163)	N/S
	Simulation	84.89	94	12.040			
Peak	Animal	113.68	71	21.318	.176	(1, 163)	N/S
	Simulation	118.68	94	22.568			
Elevation	Animal	30.97	71	17.777	.013	(1, 163)	N/S
	Simulation	33.79	94	18.970			

Table 10. Test Results Between Subject Groups Over Time (1: pre-test; 2: post-test, 3: retention-test)

Intubation Assessment	*6 Weeks Retention*	*18 Weeks Retention*	*52 Weeks Retention*
Cognitive	**Training Models: p=N/S F(1, 70)=.214** **Training Effect: p<.000 F(2, 69)=120.506** 	**Training Models: p=N/S F(1, 51)=1.963** **Training Effect: p<.000 F(2, 50)=86.455** 	**Training Models: p<.001 F(1, 38)=13.522** **Training Effect: p<.000 F(2, 37)=71.266** 
Pediatric Performance	**Training Models: p=N/S F(1, 70)=.977** **Training Effect: p<.000 F(2, 69)=15.695** 	**Training Models: p<.001 F(1, 51)=13.592** **Training Effect: p<.009 F(2, 50)=5.250** 	**Training Models: p<.001 F(1, 38)=15.246** **Training Effect: p<.002 F(2, 37)=7.427** 

Intubation Assessment	*6 Weeks Retention*	*18 Weeks Retention*	*52 Weeks Retention*
Neonatal Performance	**Training Models: p=N/S F(1, 70)=3.189** **Training Effect: p<.000 F(2, 69)=22.622** 	**Training Models: p<.000 F(1, 51)=14.160** **Training Effect: p<.004 F(2, 50)=6.044** 	**Training Models: p<.000 F(1, 38)=24.938** **Training Effect: p<.000 F(2, 37)=9.802** 
Affective	**Training Models: p=N/S F(1, 70)=.058** **Training Effect: p<.000 F(2, 69)=11.394** 	**Training Models: p=N/S F(1, 50)=.315** **Training Effect: p<.000 F(2, 49)=17.181** 	**Training Models: p=N/S F(1, 38)=.469** **Training Effect: p<.000 F(2, 37)=23.522** 

Intubation Assessment	*6 Weeks Retention*	*18 Weeks Retention*	*52 Weeks Retention*
Efficacy	**Training Models: p=N/S F(1, 70)=1.118** **Training Effect: p<.000 F(2, 69)=75.366** 	**Training Models: p=N/S F(1, 50)=.008** **Training Effect: p<.000 F(2, 49)=42.256** 	**Training Models: p<.009 F(1, 38)=7.679** **Training Effect: p<.000 F(2, 37)=25.276** 

CHOLINERGIC CRISIS RECOGNITION AND RESPONSE PERFORMANCE OUTCOMES – PRELIMINARY

Table 12. Performance Assessment Heart Rate Variability, All Subjects

		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Mean	Pre-Training	88.23	17.877	-2.475	131	.015
	Post-Training	92.27	15.207			
Peak	Pre-Training	125.05	25.147	-2.925	131	.004
	Post-Training	132.38	22.322			
Elevation	Pre-Training	36.811	24.759	-1.119	131	N/S
	Post-Training	40.106	21.195			

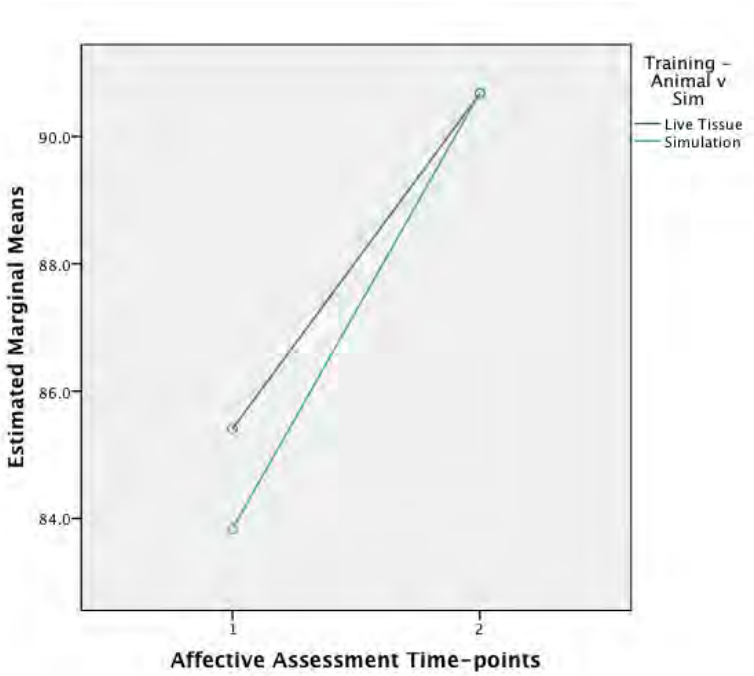
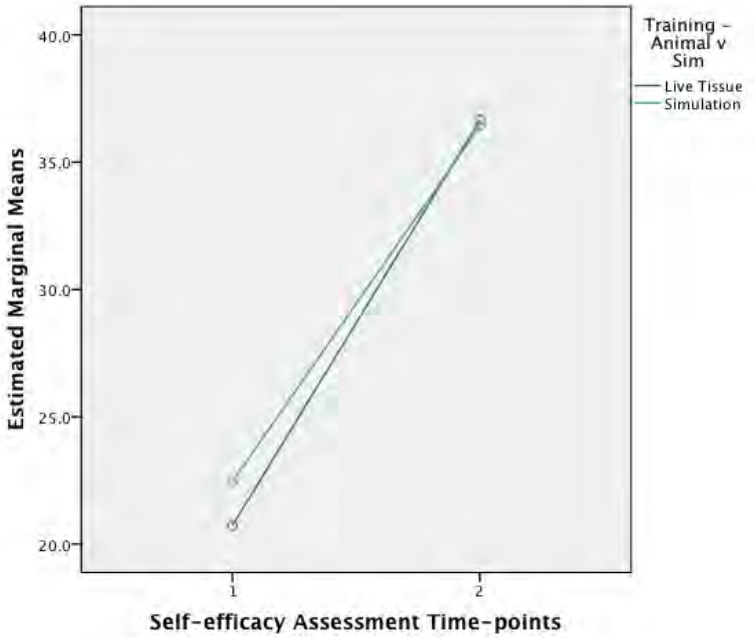
Table 13. Pre-Training Performance Assessment Heart Rate Variability Between Subject Groups (Animal vs. Simulator)

		Mean	N	Std. Deviation	F	df	Sig. (2-tailed)
Mean	Animal	86.11	70	12.762	.240	(1, 131)	N/S
	Simulation	90.49	63	22.009			
Peak	Animal	126.86	70	30.809	14.069	(1, 131)	N/S
	Simulation	122.86	63	16.529			
Elevation	Animal	40.743	70	25.162	3.545	(1, 131)	N/S
	Simulation	32.365	63	23.526			

Table 14. Post-Training Performance Assessment Heart Rate Variability Between Subject Groups (Animal vs. Simulator)

		Mean	N	Std. Deviation	F	df	Sig. (2-tailed)
Mean	Animal	92.01	70	15.734	.942	(1, 132)	N/S
	Simulation	92.47	64	14.714			
Peak	Animal	130.14	70	21.564	.930	(1, 132)	N/S
	Simulation	134.75	64	23.045			
Elevation	Animal	38.129	70	17.8723	3.365	(1, 132)	N/S
	Simulation	42.281	64	24.0188			

Table 15. Post Test Results Between Subject Groups (Animal vs. Simulator)

Cholinergic Crisis Assessments		Mean	Std. Deviation	Plot
Affective	Pre	84.68	12.667	 **Training Models: p=N/S F(1,130)=.669** **Training Effect: p<.000 F(1,130)=35.805**
	Post	90.68	11.074	
Efficacy	Pre	21.53	7.647	 **Training Models: p=N/S F(1,130)=.838** **Training Effect: p<.000 F(1,130)=605.023**
	Post	36.55	3.213	

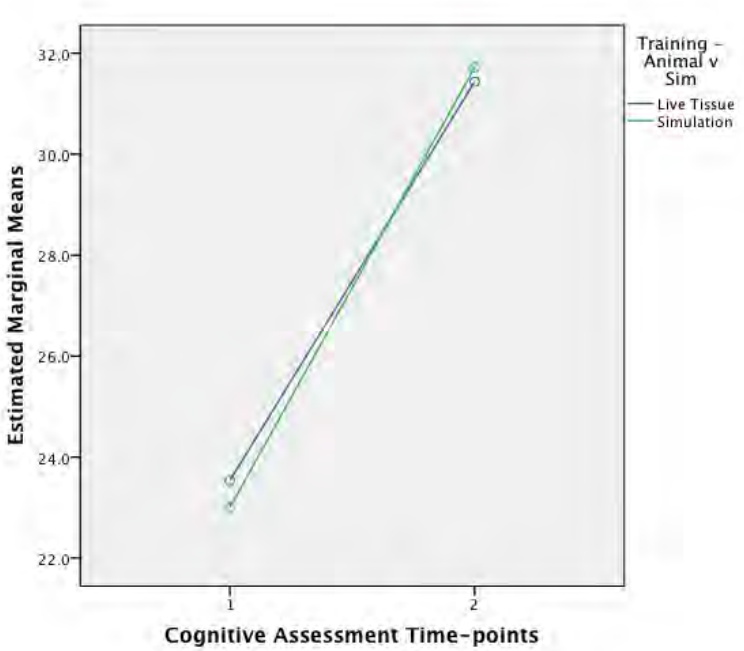
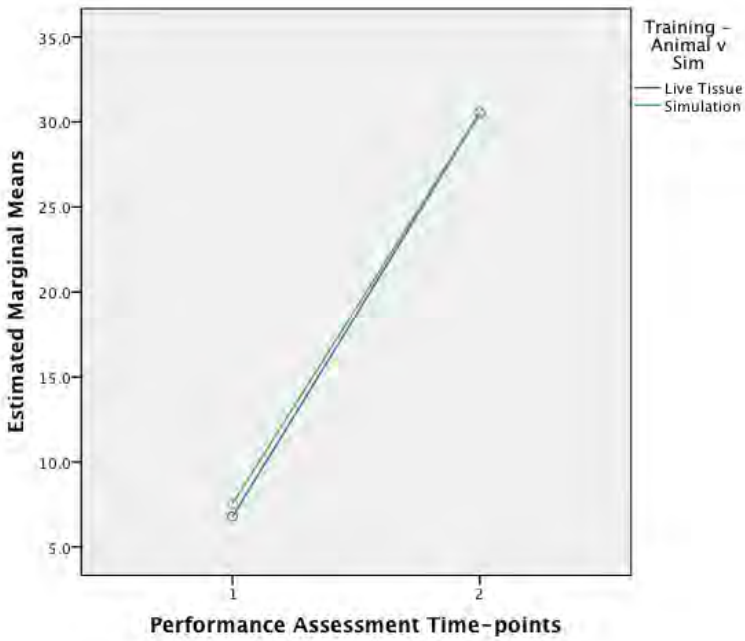
Cholinergic Crisis Assessments		Mean	Std. Deviation	Plot
Cognitive	Pre	23.28	3.385	 **Training Models: p=N/S F(1,133)=.068** **Training Effect: p<.000 F(1,133)=747.978**
	Post	31.57	3.245	
Performance	Pre	7.14	5.594	 **Training Models: p=N/S F(1,133)=.232** **Training Effect: p<.000 F(1,133)=1105.186**
	Post	30.55	6.813	

Table 16. Post Test Results Between Subject Groups (Animal vs. Simulator)

		Mean	N	Std. Deviation	F	df	Sig. (2-tailed)
Affective Scale	Animal	90.68	71	11.553	1.107	(1, 130)	N/S
	Simulation	90.69	61	10.584			
Efficacy Scale	Animal	36.65	71	3.265	.042	(1, 130)	N/S
	Simulation	36.43	61	3.175			
Cognitive Test	Animal	31.44	71	3.277	.050	(1, 133)	N/S
	Simulation	31.72	64	3.229			
Performance Assessment	Animal	30.54	71	7.945	5.604	(1, 133)	N/S
	Simulation	30.57	64	5.348			

Appendix 12: Program Review/Summary Report
(Report Date: 13 MAY 2013)

Combat Casualty Training Consortium – University of Michigan

Combat Casualty Training Consortium
Progress Report to Dr. Jonathan Woodson
Asst Secretary of Defense
for Health Affairs
13 May 2013

Award Information

- Organization: University of Michigan
- Award #: W81XWH-12-2-0001
- Principal Investigator: Pamela Andreatta, PhD
- Amount: $3.38 Million
- Period of Performance: 4 Nov 11 – 3 Dec 14
- Grants Officer Representative: Dr. Thomas Talbot, TATRC

Consortium/Research Team

Study Locations

University of Michigan Clinical Simulation Center (UMCSC)

Michigan State University Learning and Assessment Center (LACMSU)

University of Missouri

Study Topic

Lead Site
Cholinergic Crisis

Pediatric Difficult Airways

Cholinergic Crisis

Problem Being Addressed

- Cognitive dissonance from affective overload can interfere with application of knowledge & skills in a mass casualty environment.
  - Training inclusive of contextually relevant factors improves transfer to applied performance.
  - Ethical considerations using live animals for these purposes.
  - Current training evidence absent contextually-based performance assessments.
- OVERALL OBJECTIVE: Evaluate the relative impact of using live animals and high-fidelity mannequin simulators for training the recognition of medical need, and consequential clinical management of: 1) cholinergic crisis and 2) pediatric/neonatal intubation.

Objectives (Cont)

OBJECTIVE 2: Evaluation of Training Modalities

- 2.1 Management of Cholinergic Crisis: training interventions that follow a modified version of the content offered by USAMRICD in their courses "Medical Management of Chemical and Biological Casualties, and Field Management of Chemical and Biological Casualties."
  - Pre-test assessment (cognitive, psychomotor, affective) to establish baseline performance abilities.
  - Equivalent training opportunity and cover the same course content.
  - Collection of baseline, peak and mean heart rates during all hands-on study activities.
  - Post-test assessment (cognitive, psychomotor, affective) to establish post-training performance abilities.
  - Post-test assessment (cognitive, psychomotor, affective) to establish retained performance abilities will be complete after 6 weeks, 18 weeks, and 52 weeks.
- 2.2 Pediatric & Neonatal Intubation: The training interventions will follow the prescribed program offered by American Heart Association (AHA) in their course "*Pediatric Advanced Life Support (PALS)*"
  - Pre-test assessment (cognitive, psychomotor, affective) to establish baseline performance abilities.
  - Evaluate the relative differential performances of subjects who train using the simulation-based method (as derived and validated in Objective 1) and those who train using the live animal method
  - Collection of baseline, peak and mean heart rates during all hands-on study activities.
  - Post-test assessment (cognitive, psychomotor, affective) to establish post-training performance abilities.
  - Post-test assessment (cognitive, psychomotor, affective) to establish retained performance abilities will be complete after 6 weeks, 18 weeks, and 52 weeks.

Objectives (Cont)

OBJECTIVE 3: Development of Evidence-based Curricula

- Using the information gained from Objectives 1 and 2 design comprehensive curricula for the management of cholinergic crisis and pediatric/neonatal intubation. These curricula will be evidenced-based and supported by data in each of the cognitive, psychomotor and affective dimensions of performance.
  - 3.1 Cholinergic Crisis: recommend an evidence-based curriculum that is inclusive of training objectives, standards of performance, instructional methods, material and human resources, and methods of assessment to use for training individuals to proficiency in providing an effective response to cholinergic crisis.
  - 3.2 Pediatric & Neonatal Intubation recommend an evidence-based curriculum that is inclusive of training objectives, standards of performance, instructional methods, material and human resources, and methods of assessment to use for training individuals to proficiency in providing an effective response to cholinergic crisis.

Training & Assessment Schedule

Cholinergic Crisis

Training Group	Training Day	May 6-10 2013	Jun 10-17 2013	Sept 9-13 2013	Assessment Group	Assessment Day	Oct 21-25 2013	Apr 28-May 2 2014
1.1	1	20 subjects			1.1	15		Post-test (54 weeks)
1.2	2	20 subjects			1.2	15		Post-test (54 weeks)
2.1	3	20 subjects			2.1	15		Post-test (54 weeks)
2.2	4	20 subjects			2.2	15		Post-test (54 weeks)
1.3	5		20 subjects		1.3	13	Post-test (18 weeks)	
1.4	6		20 subjects		1.4	13	Post-test (18 weeks)	
2.3	7		20 subjects		2.3	13	Post-test (18 weeks)	
2.4	8		20 subjects		2.4	13	Post-test (18 weeks)	
1.5	9			20 subjects	1.5	14	Post-test (6 weeks)	
1.6	10			20 subjects	1.6	14	Post-test (6 weeks)	
2.5	11			20 subjects	2.5	14	Post-test (6 weeks)	
2.6	12			20 subjects	2.6	14	Post-test (6 weeks)	
Total Subjects: 240		80 subjects	80 subjects	80 subjects	Total Subjects: 240		160 subjects	80 subjects

Key Research Accomplishments

Comprehensive literature review and meta-analyses

- Identified training gaps:
  - Poor assessment metrics
  - Weak or absent performance standards
  - No statistically validated assessment instruments

- Identified technology gaps:
  - SimMan3G
  - SimBaby
  - SimNewB

- Derived assessment instruments
  - Established performance standards
  - Excellent validity
  - Excellent reliability

Pediatric & Neonatal Intubation Training – Technology Gaps

Simulator Technology Gaps –

- More copious secretions including saliva (frothy, bubbles, slobber), runny nose, tears, vomit
- Improved muscle fasciculation, twitching, seizures
- Airway variability – Mallampati variability, Pierre Robin airway (short mandible)
- Lung auscultation – more realistic and localized breath sounds
  - Unrealistic, can hear breath sounds from one side all over chest wall, pump noise often drown out lung sounds.
- Changes in airway: Airway material is easily punctured at vallecula and should be modified.
- More anterior airway
- Fat tongue, better tongue tissue fidelity (slippery, wet)
- More redundant airway tissues, slippery tissues, friable/bleeding,
- Large and floppy epiglottis
- True preemie (28-30 weeks, <3kg)
- Nasal flaring
- True perioral cyanosis (1cm around the mouth turning blue)

Cholinergic Crisis Training – Technology Gaps

Simulator Technology Gaps

- More copious secretions including saliva (frothy, bubbles, slobber), sweat, runny nose, tears, vomit, urine. Frothing cannot occur simultaneously with other secretions.
- Vocalizations – garbled, confused, slurring, nonsensical
- Realistic progressive occurrence of rashes, erythemas, burns, other skin conditions associated with chemical, vesicant, etc. exposure.
- Improved muscle fasciculation, twitching, seizures (no fasciculation or lower limb options)
- Airway variability – Mallampati variability, Pierre Robin airway (short mandible)
- Lung auscultation – more realistic and localized breath sounds
  - Unrealistic, can hear breath sounds from one side all over chest wall, pump noise often drown out lung sounds.
- Changes in airway: Airway material is easily punctured at vallecula and should be modified.
- For pediatric/neonatal Airways:
  - More anterior airway
  - Fat tongue, better tongue tissue fidelity (slippery, wet)
  - More redundant airway tissues, slippery tissues, friable/bleeding,
  - Large and floppy epiglottis
  - True preemie (28-30 weeks, <3kg)
  - Nasal flaring
- True perioral cyanosis (1cm around the mouth turning blue)

Outcomes (To Date)

- Pediatric and neonatal intubation performance assessment: Validity and reliability data for assessment instruments – manuscript in process.

- Simulation-based technology gaps for advanced clinical training – manuscript in process.

- Meta-analysis for pediatric/neonatal intubation training – manuscript in process.

- Meta-analysis for cholinergic crisis training – manuscript in process.

Issues / Delays

There have been several delays related to the moratorium placed on the use of the non-human primate colony at USAMRICD post-award.

- The scope change for the cholinergic crisis arm delayed the collection of sufficient data for validation analyses.
- Data collection will begin 3rd quarter 2013.

What's Next?

- All performance standards, critical steps, and potential sources for error for the clinical management of cholinergic crisis have been integrated into assessment instrument and preliminary data have been collected to assess statistical integrity. These analyses will be completed at the beginning of Q3 2013
- The multimedia application for the cholinergic crisis will be completed end of Q2 2013
  - Production schedule for the multimedia application and all associated delays should be remedied by Q3 2013
- Pediatric/neonatal intubation training using either live animal or simulator models completed Q2 2013 and anticipate post test retention at 6, 18, and 52 weeks (per the assigned subject groups) to be complete early Q4 2013.

Closing

- Have identified performance standards, critical steps, and potential sources for error for the clinical management of cholinergic crisis and performing pediatric and neonatal intubation.

- Derived assessment instruments to measure applied performance in each clinical area, and assembled validity and reliability evidence for those instruments in the area of pediatric and neonatal intubation and the management of cholinergic crisis.

- In process of collecting data for the pediatric/neonatal intubation and anticipate cholinergic crisis in the Q3 2013 time range that assist in determining optimal, evidence-based training practices that serve to reduce or eliminate the uses of live-animals without diminishing the quality of training.

Combat Casualty Training Consortium

University of Michigan / University of Minnesota

Critical Analyses and Development of Training Mechanisms: Cholinergic Crisis and Pediatric/Neonatal Intubation

Pamela Andreatta, PhD

Award #W81XWH-12-2-0001-2

19 Jun 2013

Ft. Detrick, MD

Additional Project Information

- Organization: University of Michigan*
  - Award is transferring to University of Minnesota
- Award #: W81XWH-12-2-0001-2
- Principal Investigator: Pamela Andreatta, PhD
- Amount: $3.38 Million
- Period of Performance: 4 Nov 11 – 3 Dec 14
- Grants Officer Representative: Dr. Thomas Talbot, TATRC

Team Roles & Responsibilities

- University of Michigan / University of Minnesota
  - Principal Investigator: Pamela Andreatta, PhD
  - Co-Investigator: Suzanne Dooley-Hash, MD*
  - Co-Investigator: Joseph House, MD*
- Michigan State University
  - Consultant: Bea Biddinger, DVM
  - Consultant: Joseph Hauptman, DVM
- USAMRICD
  - Consultant: Charles G. Hurst, MD
  - Consultant: James Madsen, MD
- University of Missouri
  - Consultant: Stephen Barnes, MD** (Video Production)
- TATRC
  - Consultant: Thomas B. Talbot, MD

Problem Being Addressed

- Cognitive dissonance from affective overload can interfere with application of knowledge & skills in a mass casualty environment.
  - Contextually relevant factors improves training transfer to applied performance.
  - Ethical considerations using live animals for these purposes.
  - Current training evidence absent contextually-based performance assessments.
- OBJECTIVE: Evaluate relative impact of live animals and high-fidelity mannequin simulators for training in the recognition of medical need and consequential clinical management of:

  1) Cholinergic Crisis

  2) Pediatric & Neonatal Intubation

Proposed Solution

OBJECTIVE 1:

Comprehensive Literature Review & Competency Measurement

- Identify and develop performance standards (metrics) and associated assessment instruments, as well as current training methods to create a defensible framework for facilitating, determining and evaluating competency in (1.1) managing cholinergic crisis and (1.2) pediatric/neonatal intubation.

Proposed Solution

OBJECTIVE 2:

Evaluation of Training Modalities

- 2.1 – Management of Cholinergic Crisis: Training interventions follow a modified version of the content offered by USAMRICD in "*Medical Management of Chemical and Biological Casualties*" and "*Field Management of Chemical and Biological Casualties*."
- 2.2 – Pediatric & Neonatal Intubation: Training interventions follow prescribed programs offered by American Heart Association (AHA)"
- Methodology Objectives 2.1 and 2.2
  - Pre-test assessment (cognitive, psychomotor, affective).
  - Post-training assessment (cognitive, psychomotor, affective.
  - Retention assessment (cognitive, psychomotor, affective) after 6 weeks, 18 weeks, and 52 weeks.

Proposed Solution

OBJECTIVE 3:
Development of Evidence-based Curricula

- Design comprehensive, evidence-based curricula for the management of (3.1) cholinergic crisis and (3.2) pediatric/neonatal intubation.
- Supported by data in cognitive, psychomotor and affective performance dimensions.
- Inclusive of training objectives, standards of performance, instructional methods, material and human resources, and methods of assessment for training individuals to proficiency in providing an effective response to (3.1) cholinergic crisis and (3.2) pediatric & neonatal intubation.

Military Relevance

- **Policymakers** – Implementation & sustainment of simulation-based training mechanisms DOD-wide
- **DOD-wide** – Data-driven scientific foundation upon which to discuss training modalities and effectiveness
- **DOD Education / Training Community** – Curriculum development, delivery, and assessment
- **Research Community** – Gap analyses, Technology assessments (products, materials), Performance assessments (instrumentation, standards, methods), will inform future research planning, programming, budgeting, & execution.
- **Acquisition Community** – Purchase, life-cycle management of training systems
- **Technology & Operational Communities** – Standards development & adoption, Moving towards systems interoperability.

Statement of Work & Tasks

Calendar Quarter (rounded) →			11				12				13				14			
			4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
OBJECTIVE 1: Comprehensive Literature Review and Competency Measurement (both for Cholinergic Crisis and Neonatal/Pediatric Intubation)	Nov-11	Nov-12																
Task Analysis (Completed)	Jan-12	Apr-12																
Critical Steps Identified for Respective Skills (Completed)	Feb-12	Apri-12																
Potential Sources of Errors Identified during Critical Steps																		
Systematic review of the literature, professional practice guidelines, and training pedagogies	Nov-11	Jul-12																
Performance Standards	Mar-12	Apr-12																
Instructional Needs	Mar-12	Aug-12																
Develop Performance Assessment Instruments	Apr-12	May-12																
Verify Assessment Materials	Aug-12	Aug-12																
Assemble Data-driven, defensible/comprehensible Assessment Program	Oct-12	Nov-12																
Assemble Data-driven, defensible training program	Aug-12	Aug-12																

On schedule

Delayed schedule

Statement of Work & Tasks

Calendar Quarter (rounded) →			11				12				13				14			
			4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
OBJECTIVE 2: Evaluation of Pediatric/Neonatal Intubation Training Modalities (NOTE: this is now for pediatric and neonatal intubation. Cholinergic piece still has to be modifie in the current award)	Dec-12	May-13																
Pre-assessment	Dec-12	May-13																
Training	Dec-12	May-13																
Post-Assessment 1 (Learning)	Dec-12	May-13																
Post-Assessment 2 (Retention)	Jun-13	Jun-13																
Data Analysis	Dec-12	Jun-13																
OBJECTIVE 3: Development of Pediatric/Neonatal Intubation Evidenced-based Curricula (NOTE: this is now for pediatric and neonatal intubation. Cholinergic piece still has to be modified in the current award)	Oct-12	Oct-14																
Write training objectives:	Oct-12	Jun-13																
Document standards of performance:	Oct-12	Jun-13																
Define instructional methods:	Jul-13	Jun-14																
Authenticate methods of assessment:	Mar-14	Jun-14																
Prepare Evaluation Plan: Curriculum	Mar-14	Oct-14																

On schedule

Delayed schedule

Deliverables

- Summary of findings from Objective 1.
  - Assessment instrumentation.
  - Training gap analyses.
  - Technology gap analyses.
- Report relative benefits of using live animal and simulator models for training subjects (Objective 2).
- Comprehensive evidence-based curricula (Objective 3).
  - Multimedia training application.
  - Evaluation and transition plans.

Results to Date

Comprehensive literature review and meta-analyses

- Identified training gaps:
  - Poor assessment metrics
  - Weak or absent performance standards
  - No statistically validated assessment instruments
- Identified technology gaps:
  - SimMan3G
  - SimBaby
  - SimNewb

Derived assessment instruments

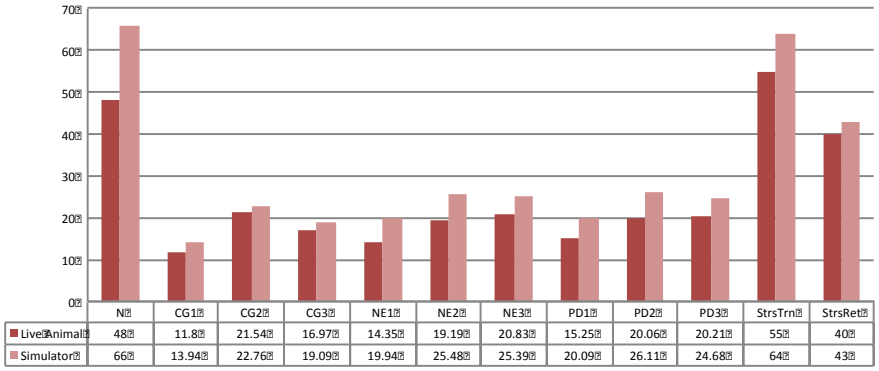
- Established performance standards
- Excellent validity
- Excellent reliability

Results to Date

Pediatric & Neonatal Intubation (*Preliminary Data*)

- P=.000 Training Effects for both animal/simulator
- Training outcomes maintained at 4-6 weeks
- N/S Difference between animal/simulator

Training Retention (6 weeks)



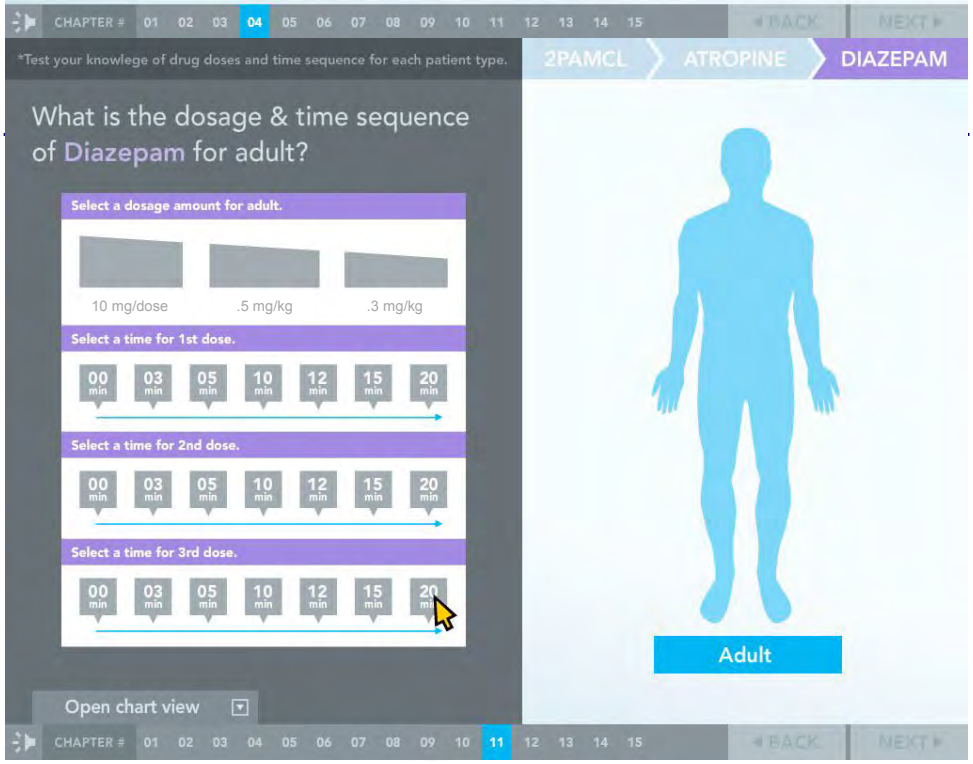
	N	CG1	CG2	CG3	NE1	NE2	NE3	PD1	PD2	PD3	StrsTrn	StrsRet
Live Animal	48	11.8	21.54	16.97	14.35	19.19	20.83	15.25	20.06	20.21	55	40
Simulator	66	13.94	22.76	19.09	19.94	25.48	25.39	20.09	26.11	24.68	64	43

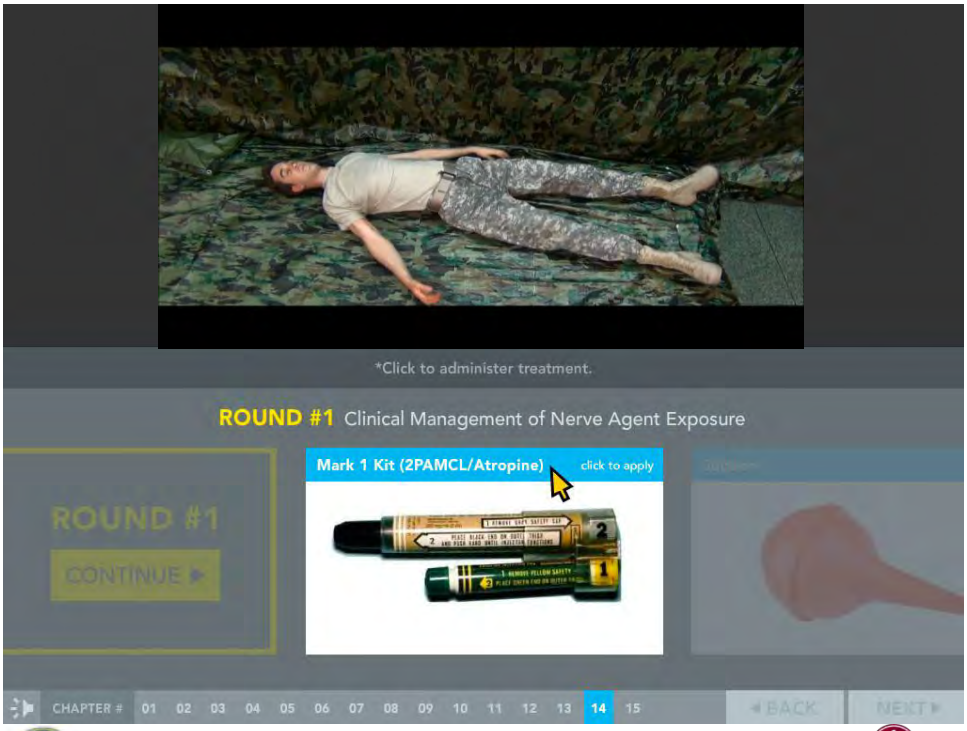
Results to Date

Produced Training Materials for Cholinergic Crisis Objectives at University of Missouri and University of Minnesota:

- Training Scripts for Missouri and Minnesota applications
- Training Video (African Green Monkey Model)
- Training Video (Human Model)
- Designed Multimedia Application for Minnesota cohort
- Produced Multimedia Application for Minnesota cohort

Example Multimedia





Publications (In Process)

- Pediatric and neonatal intubation performance assessment: Validity and reliability data for assessment instruments – manuscript in process.
- Identified simulation-based technology gaps for advanced clinical training in diagnosing and managing cholinergic crisis and the need for pediatric/neonatal intubation – manuscript in process.
- Meta-analysis for cholinergic crisis and pediatric/neonatal intubation training – manuscripts in process.

Funding Status

Budget	Expended Funds	%
$3,377,701	$1,847,109	54.69%

Challenges

- Programmatic

  There have been several delays related to the moratorium placed on the use of the non-human primate colony at USAMRICD post-award.

  - The scope change for the cholinergic crisis arm delayed the collection of sufficient data for validation analyses.
  - Data collection will begin calendar 3rd quarter 2013.
  - Schedule will likely NOT require extension.

Regulatory Items

- IRB
  - IRB Documentation is in process to move the study from oversight by University of Michigan IRB to University of Minnesota IRB
  - HRPO and ACURO notified

Next Steps

- Statistical analyses of baseline at the beginning of calendar Q3 2013.
- Multimedia application for the cholinergic crisis will be complete QA testing calendar Q3 2013.
- Recruitment and training sessions for cholinergic crisis will begin calendar Q3 2013.
- Pediatric/neonatal intubation post test retention at 6, 18, and 52 weeks (per the assigned subject groups) to be complete early calendar Q4 2013.